

# Calendar Year 2009 Annual Site Environmental Report for Sandia National Laboratories, New Mexico



Prepared by  
Sandia National Laboratories  
Albuquerque, New Mexico 87185

Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U. S. Department of Energy's National Nuclear Security Administration under Contract DE-AC04-94AL85000.

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**Annual Site Environmental Report**  
**Sandia National Laboratories, Albuquerque, New Mexico**

**PRODUCED BY:**  
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**ABSTRACT**

Sandia National Laboratories, New Mexico (SNL/NM) is a government-owned/contractor-operated facility. Sandia Corporation (Sandia), a wholly owned subsidiary of Lockheed Martin Corporation (LMC), manages and operates the laboratory for the U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA). The DOE/NNSA, Sandia Site Office (SSO) administers the contract and oversees contractor operations at the site. This annual report summarizes data and the compliance status of Sandia Corporation's environmental protection and monitoring programs through December 31, 2009. Major environmental programs include air quality, water quality, groundwater protection, terrestrial surveillance, waste management, pollution prevention (P2), environmental restoration (ER), oil and chemical spill prevention, and implementation of the National Environmental Policy Act (NEPA). Environmental monitoring and surveillance programs are required by DOE Order 450.1A, *Environmental Protection Program* (DOE 2008a) and DOE Manual 231.1-1A, *Environment, Safety, and Health Reporting* (DOE 2007).

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**Prepared By:**

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## NOTE TO THE READER

The goal for SNL/NM Annual Site Environmental Report is to present summary environmental data regarding environmental performance, compliance with environmental standards and requirements, and to highlight significant facility programs. In addition, the U.S. Department of Energy (DOE) views this document as a valuable tool for maintaining a dialogue with our community about the environmental health of this site. We are striving to improve the quality of the contents as well as include information that is important to you. Please provide feedback, comments, or questions to:

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The SNL/NM Annual Site Environmental Report (ASER) can be found at the following website:

<http://www.sandia.gov/news/publications/environmental/index.htm>

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## ACRONYMS AND ABBREVIATIONS

<b>A</b>	ABC/AQCB	Albuquerque-Bernalillo County/Air Quality Control Board
	ABCWUA	Albuquerque Bernalillo County Water Utility Authority
	ACRR	Annular Core Research Reactor
	ACE	Army Corps of Engineers
	ACGIH	American Conference of Governmental Industrial Hygienists
	AEA	Atomic Energy Act
	AHCF	Auxiliary Hot Cell Facility
	AIRFA	American Indian Religious Freedom Act
	AIS	Albuquerque International Sunport
	ALARA	as low as reasonably achievable
	AML	Advanced Materials Laboratory
	AMNTP	Advanced Mixed Waste Treatment Project
	AMPF	Advanced Manufacturing Prototype Facility
	AMPL	Advanced Manufacturing Process Laboratory
	ANG	Air National Guard
	ANOVA	Analysis of Variance
	APS	Albuquerque Public Schools
	AQC	Air Quality Compliance
	AOC	area of concern
	ARCOC	Analysis Request and Chain-of-Custody
	ARPA	Archaeological Resources Protection Act
	ASER	Annual Site Environmental Report
	AST	above-ground storage tank
	ATC	authority-to-construct
	AWN	Acid Waste Neutralization
<b>B</b>	BBS	Behavior Based Safety
	bgs	below ground surface
	BMP	Best Management Practice
	BOD	biological oxygen demand
	BSG	Burn Site Groundwater
	Btu	British Thermal Units
<b>C</b>	C&D	Construction and Demolition
	CA	Compliance Agreement
	CAA	Clean Air Act
	CAAA	Clean Air Act Amendments
	CAC	Corrective Action Complete
	CAMU	Corrective Action Management Unit
	CAN	Clean Air Network
	CAP	Consolidated Audit Program
	CATS	Corrective Action Tracking System
	CAP88	Clean Air Act Assessment Package-1988
	CARA	Concrete and Asphalt Recycling Area
	CCCL	Cleaning and Contamination Control Laboratory
	CEARP	Comprehensive Environmental Assessment and Response Program
	CEP	Chemical Exchange Program
	CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
	CERR	Consolidated Emission Reporting Rule

	CFC	Chlorofluorocarbon
	CFR	Code of Federal Regulations
	CFRC	Customer Funded Records Center
	CFU	colony forming units
	CGP	Construction General Permit
	CH <sub>4</sub>	methane
	CINT	Center for Integrated Nanotechnologies
	CME	Corrective Measures Evaluation
	CMS	Corrective Measures Study
	CMI	Corrective Measures Implementation
	CMIP	Corrective Measures Implementation Plan
	COA	City of Albuquerque
	COC	contaminants of concern
	COD	Chemical Oxygen Demand
	COOC	Compliance Order on Consent
	CO <sub>2</sub>	carbon dioxide
	CO <sub>2</sub> E	carbon dioxide equivalent
	CPG	Comprehensive Procurement Guidelines
	CPMS	Criteria Pollutant Monitoring Station
	CPA	Closure Plan Amendment
	CPR	Corporate Process Requirements
	CTF	Coyote Test Field
	CWA	Clean Water Act
	CWL	Chemical Waste Landfill
	CY	Calendar Year
<b>D</b>	D&D	decontamination and demolition
	DCG	Derived Concentration Guide
	DETS	Dynamic Explosives Test Site
	DoD	U.S. Department of Defense
	DOE	U.S. Department of Energy
	DOECAP	DOE Consolidated Audit Program
	DP	Discharge Plan
	DQO	data quality objective
	DSS	Drain and Septic Systems
<b>E</b>	EA	Environmental Assessment
	EBOM	Existing Buildings Operations and Maintenance
	ECF	Explosive Components Facility
	EDE	effective dose equivalent
	EEANM	Environmental Education Association of New Mexico
	EFM	Ecological Footprint Model
	EID	Environmental Information Document
	EIS	Environmental Impact Statement
	EHD	Environmental Health Department
	ELG	effluent limitation guidelines
	EM	Environmental Management
	EMS	Environmental Management System
	EO	Executive Order
	EPA	U.S. Environmental Protection Agency
	EPEAT	Electronic Product Environmental Assessment Tool

	EPCRA	Emergency Planning and Community Right-to-Know Act
	EPP	Environmentally Preferable Purchasing
	ER	Environmental Restoration
	ES&H	Environment, Safety, and Health
	ESA	Endangered Species Act
<b>F</b>	FEC	Federal Electronics Challenge
	FFCA	Federal Facilities Compliance Act
	FFCO	Federal Facility Compliance Order
	FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
	FOCM	Final Order for Corrective Measures
	FOP	field operating procedures
	FR	Federal Register
	FY	Fiscal Year
<b>G</b>	gha	global hectares
	GEL	General Engineering Laboratories
	GIF	Gamma Irradiation Facility
	GIS	geographic information system
	GSA	General Services Administration
	GWPP	Groundwater Protection Program
<b>H</b>	HAP	hazardous air pollutant
	HBWSF	High-Bay Waste Storage Facility
	HCF	Hot Cell Facility
	HE	high explosives
	HERMES-III	High Energy Radiation Megavolt Electron Source-III
	HLW	high-level radioactive waste
	HPML	High Power Microwave Laboratory
	HQ	Headquarters
	HSM	Heating System Modernization
	HSWA	Hazardous and Solid Waste Amendments
	HWB	Hazardous Waste Bureau
	HWMF	Hazardous Waste Management Facility
<b>I</b>	IC	institutional control
	ICM	Interim Corrective Measure
	IH	Industrial Hygiene
	ILMS	Integrated Laboratory Management System
	IPB	International Programs Building
	IPOC	Innovation Parkway Office Center
	IRP	Installation Restoration Program
	ISMS	Integrated Safety Management System
	ISO	International Organization for Standardization
	IT	Information Technology
	I-40	Interstate-40
<b>J</b>	JCEL	Joint Computational Engineering Laboratory
<b>K</b>	KAFB	Kirtland Air Force Base
	KTF	Kauai Test Facility

<b>L</b>	LANL	Los Alamos National Laboratory
	LCBS	Lurance Canyon Burn Site
	LCD	liquid crystal display
	LE	Landfill Excavation
	LECS	Liquid Effluent Control System
	LESA	Laboratory Enterprise Self Assessment
	lha	local hectares
	LLW	low-level waste
	LMC	Lockheed Martin Corporation
	LTES	Long-Term Environmental Stewardship
	LTMMP	Long-Term and Maintenance Plan
	LTS	Long-Term Stewardship
	LTTD	Low-Temperature Thermal Desorption
	LWDS	Liquid Waste Disposal System
<b>M</b>	M&O	Management and Operating
	MAC	maximum allowable concentration
	MAPEP	Mixed Analyte Performance Evaluation Program
	MBTA	Migratory Bird Treaty Act
	MCL	maximum contaminant level
	MDA	minimum detectable activities
	MDL	Microelectronics Development Laboratory (Chapters 1, 5, 6)
	MDL	minimum detection limit (Chapters 4, 7)
	MEI	maximally exposed individual
	MESA	Microsystems and Engineering Sciences Application
	MicroFab	Microsystems Fabrication facility
	MicroLab	Microsystems Integration Laboratory
	MIPP	Medical Isotope Production Project
	MP	monitoring point
	mrem/yr	millirems per year
	MSB	Manzano Storage Bunkers
	MSGP	Multi-Sector General Permit
	MSDS	Material Safety Data Sheet
	MTRU	mixed transuranic waste
	MW	mixed waste
	MWL	Mixed Waste Landfill
<b>N</b>	N/A	not available or not applicable
	NAAQS	National Ambient Air Quality Standards
	NASP	National Air Sampling Program
	NDWS	National Drinking Water Standard
	NEI	National Emission Inventory
	NELAC	National Environmental Laboratory Accreditation Conference
	NEPA	National Environmental Policy Act
	NESHAP	National Emission Standards for Hazardous Air Pollutants
	NGF	Neutron Generator Facility (aka Neutron Generator Production Facility)
	NHPA	National Historic Preservation Act
	NISAC	National Infrastructure Simulation and Analysis Center
	NM	New Mexico
	NMAC	New Mexico Administrative Code
	NMSA	New Mexico Statutes Annotated



	NMAAQS	New Mexico Ambient Air Quality Standards
	NMED	New Mexico Environment Department
	NMHWAA	New Mexico Hazardous Waste Act
	NMSWA	New Mexico Solid Waste Act
	NMWQCC	New Mexico Water Quality Control Commission
	NNSA	National Nuclear Security Administration
	NOD	Notice of Disapproval
	NOI	Notice of Intent
	NOV	Notice of Violation
	NPDES	National Pollutant Discharge Elimination System
	NPL	National Priorities List
	NPN	nitrate plus nitrite
	NRC	National Response Center (Chapter 6)
	NRC	U.S. Nuclear Regulatory Commission (Chapter 2)
	NSPS	New Source Performance Standards
	NSR	New Source Review
	NWS	National Weather Service
	N <sub>2</sub> O	nitrous oxide
<b>O</b>	ODS	Ozone-depleting substance
	OR	Occurrence Reporting
	ORPS	Occurrence Reporting Processing System
	OSHA	Occupational Safety and Health Administration
<b>P</b>	P2	Pollution Prevention
	PA/SI	Preliminary Assessment/Site Inspection
	PAAA	Price Anderson Amendment Act
	PCB	polychlorinated biphenyl
	PCC	Post-Closure
	PCCP	Post-Closure Care Permit
	PDWS	Primary Drinking Water Standard
	PEP	Performance Evaluation Plan
	PER	Performance Evaluation Report
	PETL	Processing and Environmental Technology Laboratory
	PGWS	perched groundwater system
	pH	potential of Hydrogen
	PM	particulate matter
	PM <sub>10</sub>	respirable particulate matter (diameter equal to or less than 10 microns)
	PM <sub>2.5</sub>	respirable particulate matter (diameter equal to or less than 2.5 microns)
	POTW	Publicly-owned Treatment Works
	PPE	personnel protection equipment
	PPF	Pulsed Power Facility
	PPOA	Pollution Prevention Opportunity Assessment
	PQL	Practical quantitation limit
	PRD	Process Research Development
	PSL	Primary Subliner
<b>Q</b>	QA	quality assurance
	QAPP	Quality Assurance Project Plan
	QC	quality control
	QSAS	Quality Systems Analytical Services

<b>R</b>	RAP	Remedial Action Proposal
	RCRA	Resource Conservation and Recovery Act
	R&D	research and development
	RDX	hexahydro-trinitro-triazine
	REM	removable electronic media
	RHEPP I	Repetitive High Energy Pulsed Power I (an accelerator facility)
	RITS	Radiographic Integrated Test Stand
	RMMA	Radioactive Material Management Areas
	RMWMF	Radioactive and Mixed Waste Management Facility
	ROA	Recycling Opportunity Assessment
	RPICL	Radiation Protection Instrument Calibration Laboratory
	RPSD	Radiation Protection Sample Diagnostics
	RQ	reportable quantity
	RSY	Reapplication Services Yard
<b>S</b>	Sandia	Sandia Corporation
	SAP	Sampling and Analysis Plan
	SARA	Superfund Amendments and Reauthorization Act
	SDF	Strategic Defense Facility
	SDWA	Safe Drinking Water Act
	SHPO	State Historic Preservation Officer
	SIC	Standard Industrial Classification
	SMO	Sample Management Office
	SNL/CA	Sandia National Laboratories, California
	SNL/NM	Sandia National Laboratories, New Mexico
	SOP	Standard Operating Procedure
	SOW	statement of work
	SPCC	Spill Prevention Control and Countermeasures (plan)
	SPHINX	Short Pulse High Intensity Nanosecond X-Radiator (an accelerator facility)
	SS&TP	Sandia Science & Technology Park
	SSL	sanitary sewer line (Chapter 3)
	SSL	Soil Screening Levels
	SSO	Sandia Site Office
	ST	stabilization treatment
	START	Sandia Tomography and Radionuclide Transport Laboratory
	Std Dev	Standard Deviation
	STP	Site Treatment Plan
	SUWCO	Sewer Use and Wastewater Control Ordinance
	SVE	soil vapor extraction
	SVOC	Semi Volatile Organic Compound
	SWEIS	Site-Wide Environmental Impact Statement
	SWMU	Solid Waste Management Unit
	SWP3	Storm Water Pollution Prevention Plan
	SWTF	Solid Waste Transfer Facility
<b>T</b>	TA	Technical Area
	TAG	Tijeras Arroyo Groundwater
	TAL	Target Analyte List
	TAP	toxic air pollutants
	TCE	trichloroethylene

	TCLP	toxicity characteristic leaching procedure
	TDS	total dissolved solids
	TEDS	Training and Employee Development System
	TLD	Thermoluminescent Dosimeter
	TLV	threshold limit value
	TMDL	Total Maximum Daily Load
	TNMHC	total non-methane hydrocarbon
	TOC	Total Organic Carbon
	TOMP	Toxic Organic Management Plans
	TOP	Technology and Operations Prototype
	TOX	total halogenated organics
	tpy	tons per year
	TRI	Toxic Release Inventory
	TRU	transuranic (radioactive waste)
	TSCA	Toxic Substances Control Act
	TSD	treatment, storage, and disposal
	TSP	total suspended particulate
	TSS	total suspended solids
	TTC	Thermal Test Complex
	TTF	Thermal Treatment Facility
	TTR	Tonopah Test Range
<b>U</b>	UNM	University of New Mexico
	USAF	U.S. Air Force
	USFS	U.S. Forest Service
	USGS	U.S. Geological Survey
	UST	underground storage tank
<b>V</b>	VCM	Voluntary Corrective Measure
	VOC	volatile organic compound
	VSA	Vertical Sensor Array
	VZMS	Vadose Zone Monitoring System
<b>W</b>	WIF	Weapons Integration Facility
	WIPP	Waste Isolation Pilot Plant
	WQG	Water Quality Group
<b>Z</b>	Z-Machine	Z Accelerator

## **UNITS OF MEASURE**

bgs	below ground surface	°C	degree Celsius
cm	centimeter	°F	degree Fahrenheit
fasl	feet above sea level	ft	feet
ft <sup>3</sup>	cubic feet	g	gram
gal	gallon	kg	kilogram
km	kilometer	kW	kilowatt
L	liter	lb	pound
mb	millibar	m/s	meters per second
mg	milligram	mi	mile
MMBtu	Million British Thermal Units	mph	miles per hour
ppb	parts per billion	ppbv	parts per billion by volume
sq ft	square feet	tpy	tons per year
yd <sup>3</sup>	cubic yard	yr	year
mi <sup>2</sup>	square mile		

## **RADIOACTIVITY MEASUREMENTS**

rem	roentgen equivalent man	Sv	Sievert
mrem	millirem (unit of radiation dose)	Ci	curie
person-Sv	person-Sievert (unit of radiation dosage)	pCi	picocurie
person-rem	radiation dose to population (also man-rem)	μg	microgram
mSv	millisievert (unit of radiation dosage)	mR	milliroentgen
μR/hr	microroentgen per hour		

## **APPROXIMATE CONVERSION FACTORS FOR SELECTED SI (METRIC) UNITS**

Multiply SI (Metric) Unit	By	To Obtain U.S. Customary Unit
Cubic meters (m <sup>3</sup> )	35.32	Cubic feet (ft <sup>3</sup> )
Centimeters (cm)	0.39	Inches (in.)
Meters (m)	3.28	Feet (ft)
Kilometers (km)	0.61	Miles (mi)
Square kilometers (km <sup>2</sup> )	0.39	Square miles (mi <sup>2</sup> )
Hectares (ha)	2.47	Acres
Liters (L)	0.26	Gallons (gal)
Grams (g)	0.035	Ounces (oz)
Kilograms (kg)	2.20	Pounds (lb)
Micrograms per gram (mg/g)	1	Parts per million (ppm)
Milligrams per liter (mg/L)	1	Parts per million (ppm)
Celsius (°C)	9/5 °C + 32 = °F	Fahrenheit (°F)
Sievert (Sv)	100	roentgen equivalent man (rem)



# Executive Summary

Sandia National Laboratories, New Mexico (SNL/NM) is one of the nation's premier multi-program national security laboratories. Sandia Corporation (Sandia), a wholly owned subsidiary of Lockheed Martin Corporation (LMC), manages and operates the laboratory for the U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA). The DOE/NNSA, Sandia Site Office (SSO) administers the contract and oversees contractor operations at the site. This Annual Site Environmental Report (ASER) was prepared in accordance with and as required by DOE Order 450.1A, *Environmental Protection Program* (DOE 2008a) and DOE Manual 231.1-1A, *Environment, Safety, and Health Reporting Manual* (DOE 2007). This ASER summarizes the environmental protection, restoration, and monitoring programs in place at SNL/NM for Calendar Year (CY) 2009. It also discusses Sandia's compliance with environmental statutes, regulations, and DOE directives and permit provisions; and it highlights significant environmental program efforts and accomplishments. This ASER is a key component of DOE's effort to keep the public informed about environmental conditions throughout the DOE/NNSA nuclear weapons complex.

## **Environmental Programs**

Sandia's methodology for managing and implementing its Environment, Safety, and Health (ES&H) Program is outlined in the Integrated Safety Management System (ISMS). The ISMS is centered upon five safety management functions that provide processes to guide management in identifying and controlling hazards. Furthermore, Sandia implemented an Environmental Management System (EMS) to enhance the ISMS. The EMS is the component of ISMS that addresses the environmental aspects and impacts of SNL/NM's activities, products, and services. SNL/NM continued to improve environmental management and received International Organization for Standardization (ISO) 14001 Certification in 2009.

Further information about EMS and ISMS can be found in Chapters 3 and 8 of this report.

While all 2009 program activities are performed continuously, they are reported in this ASER on a CY basis, unless otherwise noted (programs based on the Fiscal Year [FY] run from October 1st through September 30th, annually). A summary of the primary environmental programs in place at SNL/NM are summarized in the following sections.

## ***Waste Management***

Waste at SNL/NM is processed at nine facilities: the Hazardous Waste Management Facility (HWMF), the Thermal Treatment Facility (TTF), the Radioactive and Mixed Waste Management Facility (RMWMF), five Manzano Storage Bunkers (MSB), and the Solid Waste Transfer Facility (SWTF). In addition, the Reapplication Services Yard (RSY) processes material and equipment for recycling, after it is determined that it cannot be reappplied or sent for auction. Additional information about waste management programs and activities can be found in Chapters 2 and 3.

## ***Pollution Prevention (P2)***

The P2 Program provides assessment, guidance and assistance to the line to implement measures that reduce resource use and generated waste and to enhance the overall efficiency of processes and organizations within SNL/NM. Additionally, the P2 Program works with several of the above facilities to continue or initiate new recycle avenues for waste. In 2009, SNL/NM received several awards for P2 accomplishments (see Section 3.5.2).

## ***Environmental Restoration (ER) Project***

The ER Project currently collects groundwater samples at five general project areas: the Chemical Waste Landfill (CWL), the Mixed Waste Landfill (MWL), Technical Area (TA)-V, Tijeras Arroyo Groundwater (TAG), and Burn Site Groundwater (BSG). Water quality results reported by the ER Project were consistent with past years' analytical results.

At the close of CY 2009, there were 33 regulated ER sites remaining to be completed at SNL/NM. Of these 33 remaining sites, 31 have received Corrective Action Complete (CAC) determinations from the New Mexico Environment Department (NMED). These 31 sites are currently in the public comment process with a hearing anticipated in 2010. The two remaining sites consist of the CWL, which is undergoing final closure activities, and the MWL where the final remedy (soil cover) was completed during 2009. In addition to the 33 sites, final remedies are pending for three groundwater areas of concern (AOC) (TA-V, TAG, and BSG), and three sites with potential soil contamination will be evaluated at the completion of their test operations. Additional information is included in Chapter 3.

#### ***Long-Term Environmental Stewardship (LTES)***

The SNL/NM LTES Program provides environmental stewardship for past, present, and future activities at SNL/NM. LTES “promotes the long-term stewardship of a site’s natural and cultural resources throughout its operational, closure, and post-closure life cycle” (DOE/SNL 2006). The environmental programs referred to in this document support that stewardship. Further information can be found in Chapter 3 of this report.

#### ***Long-Term Stewardship (LTS)***

A major component of the LTES Program is LTS of legacy sites. Stewardship of legacy sites is defined as activities necessary to maintain long-term protection of human health, the environment, and natural and cultural resources from hazards associated with residual radioactive and hazardous contamination at former ER sites. Sandia’s LTS activities are increasing as remedial activities required at ER sites are completed. The LTS Program conducts compliance oversight activities, including long-term monitoring, to comply with NMED requirements. A monitoring well network of more than 50 wells is sampled for presence of contaminants of concern (COC) at various intervals during the year. The data from this sampling activity are evaluated on an ongoing basis and kept in a comprehensive database. The LTS Program also conducts institutional control (IC) and community outreach to keep the public informed of LTS Program activities. Compliance Oversight Activities, IC Activities and Community Liaison and Stakeholder Involvement Activities for 2009 are summarized in

Section 3.3 of this report. Additional information can be obtained on the LTS website:

<http://ltes.sandia.gov>

#### ***Terrestrial Surveillance***

The terrestrial surveillance sampling activities are conducted to detect any potential releases or migration of radiological or non-radiological contaminated material to off-site locations. Soil, sediment, and vegetation are collected from on-site, perimeter, and off-site locations (community locations outside Kirtland Air Force Base [KAFB] boundaries). In 2009, there were no terrestrial sample results that indicated concerns or that further investigation or corrective action was warranted.

In addition to routine sampling at all planned locations for non-radiological parameters, a special sampling effort was made to document that no high explosive (HE) residue was present at a former land mine experimental site. These results showed that there was no high HE residue and these results will serve as a baseline for future reference regarding non-radiological results in nearby soils. Additional information is included in Chapter 4.

#### ***Air Quality***

Ambient Air Monitoring – Sandia measures ambient air quality at six locations throughout SNL/NM, and compares results with National Ambient Air Quality Standards (NAAQS) and local ambient air regulations. The network monitors criteria pollutants and VOCs.

Air Quality Compliance (AQC) – Air quality standards are implemented by regulations promulgated by local and federal governments in accordance with the Clean Air Act (CAA) and the CAA Amendments (CAAA) of 1990. The Albuquerque Bernalillo County Air Quality Control Board (ABC/AQCB), the State of New Mexico and the EPA determine applicable air quality standards for non-radiological pollutants.

The AQC program currently maintains 16 issued authority-to-construct (ATC) New Source Review (NSR) permits; and ten issued NSR registrations from the City of Albuquerque (COA). Currently, there are three NSR source registrations pending issuance with the COA.



### Radiological National Emission Standards Hazardous Air Pollutants (NESHAP) Compliance

– Subpart H of NESHAP regulates radionuclide air emissions from DOE/NNSA facilities, with the exception of naturally occurring radon. In 2009, there were 14 SNL/NM facilities reporting NESHAP regulated emissions. Of these 14 sources, 13 were point sources and one a diffuse source. In 2009, the primary radionuclides released were tritium and argon-41. In 2009, the on-site maximally exposed individual (MEI) was located on KAFB. The on-site MEI dose of  $1.05 \text{ E-}03$  millirems per year (mrem/yr) at the Honeywell Systems Support Site resulted primarily from releases of tritium from the nearby Neutron Generator Facility (NGF) in TA-I. The off-site MEI was located at the Eubank Gate Area. The MEI of  $4.76 \text{ E-}04$  mrem/yr at the Eubank Gate Area resulted also primarily from releases of tritium from the NGF in TA-I. Both doses are well below the 10 mrem/yr EPA standard. Additional information is available in Chapter 5.

### ***Water Quality***

Wastewater—Wastewater from SNL/NM is discharged from six on-site outfalls permitted by the Albuquerque Bernalillo County Water Utility Authority (ABCWUA). Wastewater monitoring is conducted to ensure that all discharges meet the standards set by the ABCWUA's publicly owned treatment works (POTW). During CY 2009, there were no reportable events and all discharge parameters were met; this resulted in SNL/NM receiving six "Gold Pre-Treatment Awards" from the ABCWUA for the 2008-2009 treatment year.

Wastewater/Surface Discharge – All water that will be discharged to the ground surface, either directly or to lined containments, must meet State of New Mexico surface discharge standards. All discharges in 2009 met NMED New Mexico Water Quality Control Commission (NMWQCC) standards and were approved by Sandia. Additionally, routine surface discharges are made to two evaporation lagoons that service the Pulsed Power Facility (PPF) under an existing discharge permit. During CY 2009, all permit requirements were met for both lagoons; there were nine surface releases reported to NMED. These reportable releases are documented in Sections 2.2.2 and 6.2.2 of this report.

Storm Water Runoff – In CY 2009, the only analytical monitoring that was required under SNL/NM's National Pollutant Discharge Elimination System (NPDES) 2000 Multi-Sector General Permit (MSGP) for Storm Water Discharges Associated with Industrial Activities (Multi-Sector General) was for an annual fecal coliform analysis required by the State of New Mexico. A fecal coliform sample was collected in September 2009 at SNL/NM's primary outfall to Tijeras Arroyo. The lab reported a positive result for fecal coliform at 60,000 colony forming units (CFU)/100 milliliters (ml) and this result was submitted to the State of New Mexico in October 2009. However, as a best management practice (BMP), environmental surveillance sampling was done. Additional information is included in Chapter 6.

Oil Storage and Spill Control – Sandia's Spill Prevention Control and Countermeasures (SPCC) Plan (required under the Clean Water Act [CWA]) describes the oil storage facilities at SNL/NM and the mitigation controls in place to prevent inadvertent discharges of oil. The facilities at SNL/NM that are subject to regulations include oil storage tanks (aboveground storage tanks [AST] and underground storage tanks [UST]), bulk storage areas (multiple containers), and temporary or portable tanks. Sandia currently operates 46 ASTs and five USTs at SNL/NM. Additional information is included in Chapter 6.

### ***Groundwater Protection***

The Groundwater Protection Program (GWPP) includes general surveillance of water quality from a network of wells not directly associated with ER Project sites. Annual samples were collected from 14 wells and one spring. Analyses were conducted for metals, volatile organic compounds (VOC), inorganics (including nitrate, anions, and cyanide), phenolics, alkalinity, total halogenated organics (TOX), gross alpha, gross beta, and selected radionuclides. Groundwater samples from six wells were analyzed for HE. The designated wells are used to establish background concentrations of HE at the Dynamic Explosives Test Site (DETS) east and south of TA-III and to monitor potential groundwater impacts from explosive testing. For more detailed information refer to Chapter 7 of this report.

ER – The ER Project collects groundwater samples at five general project areas: the CWL, the MWL, TA-V, TAG, and BSG. Trace amounts of toluene was detected in several samples from the MWL. All values were below the MCL of 1,000 µg/L and the practical quantitation limit (PQL) of 1.0 micrograms per liter (µg/L). Nitrate plus nitrite results above the MCL of 10 mg/L were detected in four wells at the TAG, with the highest value being 29.4 milligrams per liter (mg/L). Trichloroethylene was detected above the maximum contaminant level (MCL) of 5 µg/L in two wells at the TAG. The highest value was 8.55 µg/L. At the BSG area of concern nitrate plus nitrite exceeded the MCL in two wells. The high value was 39.9 mg/L in one of the wells. The other well has a high of 11 mg/L. Water quality results for the ER projects areas were consistent with results from past years. Perchlorate concentrations in CYN-MW6 exceeded the 0.004 mg/L screening level established in the Compliance Order on Consent (COOC). The maximum concentration of 0.00724 mg/L was detected during the March 2009 sampling event. No MCL or maximum allowable concentration (MAC) currently exists for perchlorate, although the NMED identifies perchlorate as a potential toxic pollutant. All other inorganic chemical analytical results were below established MCLs. Additional information can be found in Chapter 7.

### ***National Environmental Policy Act (NEPA) Activities***

The Site-Wide Environmental Impact Statement (SWEIS) update process continued to undergo revision during CY 2009 to better track and evaluate environmental operational limits at both the facility and site level.

The NEPA Team participated in the review and completion of the following environmental documents:

- *Draft Site-Wide Environmental Impact Statement for the Continued Operation of the Department of Energy/National Nuclear Security Administration Nevada Test Site and Off-Site Locations in the State of Nevada, and*
- *Draft Classified Waste Landfill Excavation at Sandia National Laboratories/New Mexico.*

The NEPA Team reviewed a total of 1,208 proposed projects in the ISMS NEPA module and other corporate applications. Ninety DOE NEPA checklists were transmitted to the DOE/NNSA/SSO for review and determination in 2009.

# 1.0 Introduction

This Annual Site Environmental Report (ASER) is prepared in accordance with the requirements set forth for all large U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA) facilities, which include Sandia National Laboratories, New Mexico (SNL/NM). This ASER describes the environmental protection programs currently in place at SNL/NM. The report is made available to the general public in printed and electronic form.

## 1.1 Sandia Corporation's History and Mission

Sandia Corporation (Sandia), a Lockheed Martin Corporation (LMC), a wholly owned subsidiary company, manages and operates the laboratory for the DOE/NNSA. The DOE/NNSA, Sandia Site Office (SSO) administers the contract and oversees contractor operations at the site. Sandia has developed technologies for nuclear weapons, non-proliferation, homeland security, energy and infrastructure, defense systems and assessments, and research and development (R&D) programs to support all national security missions.

### 1.1.1 History

SNL/NM began operations in 1945 as Z Division, the ordnance design, testing, and assembly arm of Los Alamos Scientific Laboratory (now Los Alamos National Laboratory [LANL]). The division moved to Sandia Base (now merged into Kirtland Air Force Base [KAFB]) on the perimeter of the City of Albuquerque (COA), to be near an airfield and to work closely with the military. Due to its growth, Z Division became a separate branch of Los Alamos in 1948, and was renamed Sandia Laboratory. On November 1, 1949, Sandia, a wholly owned subsidiary of Western Electric, began managing SNL/NM. In 1979, Congress recognized the facility as a national laboratory. In 1993, Sandia became a wholly owned subsidiary of Martin Marietta, now LMC.

### 1.1.2 Mission

Sandia's enduring mission is to provide science and engineering support for the nation's nuclear weapons stockpile. Today, that mission has grown to include other critical aspects of national security, including the non-proliferation of weapons of mass destruction, developing technologies and strategies for responding to emerging threats, and protecting and preventing the disruption of critical infrastructures. Sandia also collaborates with representatives from the industrial sector, universities, and other government agencies to develop and commercialize new technologies. Information about recent technologies developed at SNL/NM can be found at the following web site:

<http://www.sandia.gov/LabNews>

### 1.1.3 Sandia's Operations Contract

Sandia, like all regulated industries, complies with specific environmental regulations established by local, state, and federal agencies. The Management and Operating (M&O) Contract between Sandia and the DOE defines the primary contractual obligations for operating SNL/NM. This contract also drives Sandia's Environment, Safety, and Health (ES&H) standards and requirements.

The M&O Contract states that Sandia must comply with DOE directives that establish specific requirements for environmental programs. The six primary DOE directives currently on the contract baseline that pertain to environmental protection and management, starting with the most recent, are listed below:

- DOE Order 450.1A, *Environmental Protection Program* (DOE 2008a).
- DOE Manual 231.1-1A, *Environment, Safety, and Health Reporting* (DOE 2007).
- DOE Manual 231.1-2, *Occurrence Reporting and Processing of Operations Information* (DOE 2003).

- DOE Order 435.1, Chg 1, *Radioactive Waste Management* (DOE 2001).
- DOE Order 5400.5, Chg 2, *Radiation Protection of the Public and the Environment* (DOE 1993).
- DOE Order 430.2B, *Departmental Energy, Renewable Energy and Transportation Management* (DOE 2008).

## 1.2 SNL/NM's Site Location and Characteristics

### 1.2.1 General Site Characteristics

KAFB is a 51,559-acre military installation that includes 20,486 acres withdrawn from the Cibola National Forest through an agreement with the U.S. Forest Service (USFS). Located at the foot of the Manzanita Mountains, it has a mean elevation of 5,384 feet (ft) and a maximum elevation of 7,986 ft. KAFB is host to more than 150 tenant groups, with over 27,000 vehicles (mostly single occupancy) passing through its secured check points each week day (based on data from 2002). The estimated number of vehicles entering KAFB is shown below.

Gate	Estimated Number of Cars per Day
Eubank	10,000
Wyoming	8,250
Gibson	7,500
Carlisle	500
Truman	500
South Gate	250
<b>DAILY TOTAL</b>	<b>27,000</b>
<b>YEARLY TOTAL</b>	<b>6,615,000</b>

In 2009, Sandia conducted operations on 5,817 acres of Air Force property leased to DOE/NNSA, and 2,841 acres of property owned by DOE, yielding a total of 8,658 acres of landholdings for SNL/NM. The site housed 9,530 staff, who operated in approximately 5.4 million square feet (sq ft) of on-site building space, and an additional 300,000 sq ft of off-site building space leased by DOE/NNSA for SNL/NM. Most operations are within five TAs (TA-I, -II, -III, -IV,

and -V). An additional 9,000 acres serve as a buffer zone near the southwest boundary of KAFB. This buffer zone, leased from the State of New Mexico and Isleta Pueblo, provides margins of safety and sound buffers for SNL/NM testing activities (see Figure 1-1).

### ***Borders***

KAFB and SNL/NM are located adjacent to the COA, which borders KAFB on its north, northeast, west, and southwest boundaries. The Albuquerque International Sunport (airport) and Mesa del Sol, an emerging 12,500-acre mixed-use urban development, are just beyond the base's western borders, as is the Rio Grande. The development's master plan projects that the community will ultimately reach 90,000 residents. To date, several business and industrial facilities have been completed; however, no residential development has begun.

Mountains on the east and plains on the west create a diverse range of geological, hydrological, climatic, and ecological settings, and are further detailed in this chapter.

### ***Areas within Borders***

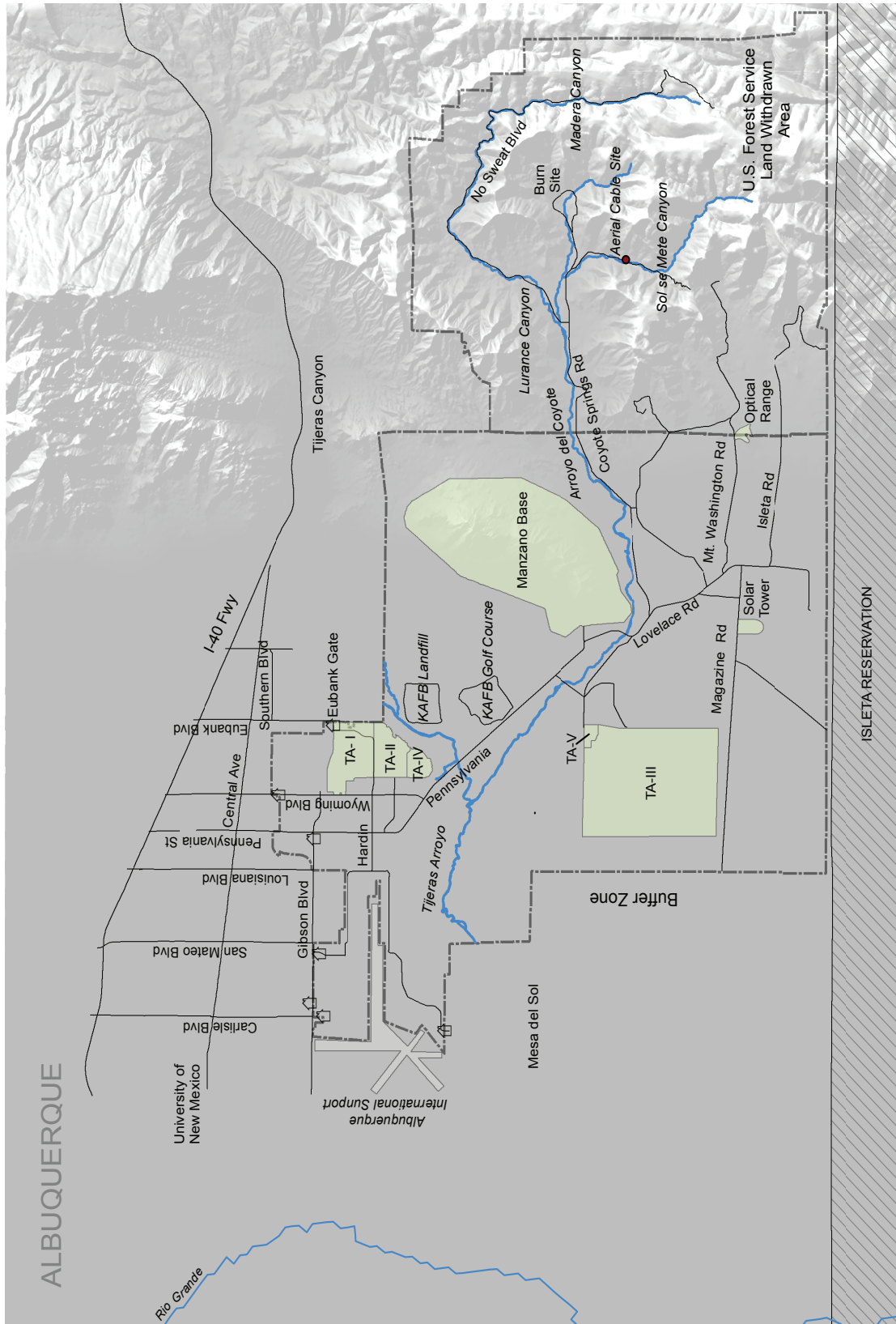
SNL/NM consists of five secured technical areas (TA), buildings in non-secured areas, and several remote testing areas. These remote test areas are collectively known as the Coyote Test Field (CTF) and are located in the canyons on the west side of the Manzano Mountains. The Burn Site is located in the northeast region of KAFB and the Thermal Test Complex (TTC) is located within TA-III. The National Solar Thermal Test Facility is located southeast of TA-III. See Figure 1-1 for an illustration of the area.

### 1.2.2 Technical Areas

#### ***TA-I***

TA-I is the focus of SNL/NM's operations and houses the main administrative center and a close grouping of laboratories and offices. A majority of activities performed in TA-I are dedicated to design, R&D of weapon systems, limited production of weapon systems components, and energy research programs. Facilities in TA-I include the main technical library, several assembly/manufacturing areas, and various laboratories, such as the Advanced Manufacturing Processes Laboratory (AMPL), the Neutron Generator Facility (NGF), the Processing and Environmental Technology Laboratory (PETL), the Joint Computational Engineering Laboratory





**FIGURE 1-1.** SNL/NM Technical Areas and the U.S. Forest Service Land Withdrawn Area

(JCEL), and the Microsystems and Engineering Sciences Applications (MESA) Complex. The MESA Complex consists of the MESA Microelectronics Development Laboratory (MDL), the MESA Office and Light Laboratory, the Microsystems Fabrication (MicroFab) Facility, the Microsystems Integration Laboratory (MicroLab), and the Weapons Integration Facility (WIF). The MESA Complex provides the systems designers, component designers, processes, and equipment to design and prototype qualified microsystem-based components for maintaining a national nuclear deterrent.

#### **TA-II**

TA-II includes facilities and lands south of the TA-I boundary at Hardin Boulevard and extends to the northern boundary of TA-IV. The Explosive Components Facility (ECF), the Hazardous Waste Management Facility (HWMF), the Facilities Command Center (FCC), the Solid Waste Transfer Facility (SWTF), the Construction and Demolition (C&D) Recycle Center, and the National Infrastructure Simulation & Analysis Center (NISAC) are all within TA-II.

#### **TA-III**

TA-III is the largest and most remote of all the TAs, and is characterized by facilities separated by extensive undeveloped areas. TA-III is used to accommodate large-scale engineering test activities requiring large safety and/or security area buffers, such as collision testing sled tracks, centrifuges, and the TTC. Other facilities include the Radioactive and Mixed Waste Management Facility (RMWMF), the Chemical Waste Landfill (CWL), the Mixed Waste Landfill (MWL), the Classified Waste Landfill, and the Corrective Action Management Unit (CAMU).

#### **TA-IV**

TA-IV, located south of TA-II, houses facilities used to conduct R&D activities in inertial-confinement fusion, pulsed power, and nuclear particle acceleration. Accelerators located in TA-IV include the Z Accelerator (Z-Machine), the Advanced Pulsed Power Research Module (APPRM), the Radiographic Integrated Test Stand (RITS), the High Energy Radiation Megavolt Electron Source-III (HERMES-III), the Saturn Accelerator, the Repetitive High Energy Pulsed Power I (RHEPP I) Accelerator, the High Power Microwave Laboratory (HPML), and the Short-Pulse High Intensity Nanosecond X Radiator (SPHINX).

#### **TA-V**

TA-V, located adjacent to the northeast corner of TA-III, includes facilities that routinely handle radioactive materials used in experimental R&D programs. TA-V houses the Gamma Irradiation Facility (GIF), the Annular Core Research Reactor (ACRR), the Hot Cell Facility (HCF), and the Auxiliary Hot Cell Facility (AHCF).

### **1.2.3 Other Facilities**

#### ***Remote Test Areas***

Several remote test areas are located east and southeast of TA-III and within the canyons and foothills of the USFS withdrawn area (Arroyo del Coyote, and Lurance, Madera, and Sol se Mete Canyons). These areas are used for explosive ordnance testing, rocket firing experiments, and open burn thermal tests.

#### ***Facilities Outside of KAFB's Boundaries***

Some of the facilities utilized by Sandia personnel, or on DOE property, are outside the boundaries of KAFB. The Center for Integrated Nanotechnologies (CINT), the MESA Technology and Operations Prototype (TOP), the International Programs Building (IPB), the Innovation Parkway Office Center (IPOC), and the new National Museum of Nuclear Science & History are all located on Eubank Boulevard Southeast (within one mile of KAFB). There are many other small-scale, off-site SNL/NM projects, including the Advanced Materials Laboratory (AML) at the University of New Mexico (UNM).

### **1.3 ES&H at SNL/NM**

Sandia's ES&H Program has grown and progressed, as detailed in the ES&H Corporate Policy System Documents, a dynamic online resource available to all Sandia personnel. These documents clearly describe ES&H requirements for conducting all levels of work at SNL/NM.

<http://www.sandia.gov/esh/>

Improved waste management practices have been implemented, and state-of-the-art waste handling facilities have been constructed to handle and properly dispose of hazardous, radioactive, and solid waste. Waste minimization and recycling practices have been very successful in reducing SNL/NM's environmental impact. Several audits have been conducted in recent



years by the U.S. Environmental Protection Agency (EPA), various DOE/NNSA offices, the COA, the Albuquerque Bernalillo County Water Utility Authority (ABCWUA), and the State of New Mexico. The results of these audits, as well as SNL/NM internal audits, support Sandia's ongoing commitment to ES&H practices at SNL/NM.

### ***Implementing ES&H***

Sandia's strategy for managing and implementing its ES&H Program is described by the Integrated Safety Management System (ISMS) which is structured around five safety-based management functions:

- (1) Plan the work,
- (2) Analyze the work hazards,
- (3) Control those hazards,
- (4) Perform the work, and
- (5) Get feedback and make improvements.

The ISMS provides processes that guide line management to identify and control hazards. For further information on audits and appraisals, refer to Section 2.3.



### ***Environmental Management Programs***

As part of its mission, Sandia addresses ES&H issues through its environmental management (EM) programs. EM programs include waste management, pollution prevention (P2), environmental restoration (ER), long-term environmental stewardship (LTES), water quality (surface discharge, groundwater, storm water, and waste water), oil storage, air quality, National Environmental Policy Act (NEPA), terrestrial and ecological surveillance, and quality assurance (QA).

### ***Environmental Management System (EMS)***

Sandia strives to be a leader in environmental stewardship through the implementation of an EMS. In 2009, Sandia upgraded the EMS Program to fully conform to the international standard for EMS, International Organization for Standardization (ISO)14001-2004 (IOS 2004) and received third-party certification to the standard. Sandia received ISO 14001 certification in 2009. The EMS is utilized to plan, review, execute, and improve work processes, with the intent of improving upon the environmental elements in the ISMS. ES&H considerations are incorporated into each element of all work processes conducted by Sandia. For additional information on the EMS, refer to Section 3.1.

#### ***1.3.1 Managing a Legacy of Contamination***

SNL/NM was ranked as one of the least contaminated DOE facilities. Corrective action is complete at all but five of 268 ER sites, based on determinations by the New Mexico Environment Department (NMED). Permit modifications for 31 of the completed sites are currently in the public comment process with a hearing anticipated in 2010. The two remaining sites are the MWL and the CWL. In addition to the 33 sites, final remedies are pending for three groundwater areas of concern (TA-V, TAG and BSG), and three sites with potential solid contamination will be evaluated at the end of their test operations. In December 2008, NMED granted approval of the Corrective Measures Implementation Plan (CMIP) for the MWL, and the final corrective action was completed in 2009. The remaining site is the CWL. The CWL Closure Plan Amendment (CPA), the CWL Post-Closure Care Permit (PCCP), and the CWL Final Remedy were approved by the NMED in October 2009. After installation of four new groundwater monitoring wells and NMED approval of the Final CWL Resource Conservation and Recovery Act (RCRA) Closure Report, monitoring at the CWL will be performed under the CWL PCCP.

Some sites require long-term monitoring to ensure that any residual contamination does not migrate from the site. Detailed information about EM cleanup efforts throughout DOE can be found at DOE's website, and at Sandia's LTES website:

<http://www.em.doe.gov/pages/emhome.aspx>  
<http://www.sandia.gov/ltes>

## **1.4 Regional Characteristics**

SNL/NM is set in a high desert region in central New Mexico. The adjacent land areas are the most densely populated area in New Mexico. Refer to Figures 1-1 and 1-2 for illustrations of the regions described below.

### **1.4.1 Regional Topography and Layout**

KAFB has a widely varied topography, ranging from rugged mountains on the east to flat plains on the west. The maximum elevation of 7,986 ft occurs on the eastern edges of KAFB, which includes 20,486 acres withdrawn from the Cibola National Forest (through an agreement with the USFS).

The mean elevation of 5,384 ft is typical of the remainder of KAFB, which is situated on gently west-sloping foothills that grades into wide, flat areas; this topology is where the majority of SNL/NM facilities are situated.

#### ***The Mountains***

The most spectacular topographic feature in the Albuquerque region is the Sandia Mountains, which form an impressive backdrop to the east of the COA and KAFB. The Sandias form a 13-mile long escarpment distinguished by steep cliffs, pinnacles, and narrow canyons; the tallest point is Sandia Crest at 10,678 ft. At sunset, the mountains are often bathed briefly in a pinkish glow, which is how the Sandias got their name (“sandia” is Spanish for “watermelon”).

The Sandia Mountains are divided from the Manzanita and Manzano Mountains (to the south) by Tijeras Canyon, which is traversed by Interstate 40 (I-40). KAFB is located a few miles south of I-40 (see Figure 1-1).

#### ***Tijeras Arroyo***

At approximately  $\frac{3}{4}$  of a mile wide, Tijeras Arroyo is a significant topographic feature that cuts diagonally northeast to southwest across KAFB. The watershed drained by Tijeras Arroyo includes the southern Sandia Mountains, the Manzanita Mountains, and the north end of the Manzano Mountains. The arroyo is normally dry except during heavy downpours, which can cause significant flash floods. The arroyo originates in Tijeras Canyon and runs coincident with the Tijeras Fault for several miles before deviating to the southwest, where it discharges to the Rio Grande about eight miles from the west boundary of KAFB.

#### ***Rio Grande***

The Rio Grande flows to the west of the KAFB’s boundaries. A new water treatment plant was recently completed which includes 40 miles of new pipeline. Water testing for the San Juan Chama Drinking Water Project was completed by the ABCWUA and water from the new water treatment plant began flowing to customers in December 2008 (for additional information refer to the ABCWUA website).

<http://www.abcwua.org>

### **1.4.2 Population**

New Mexico is the fifth largest state in the U.S. comprising 121,000 square miles (mi<sup>2</sup>). The population estimate for New Mexico is projected to be approximately 1,980,225 by 2010 according to the U.S. Census. The largest city in New Mexico is Albuquerque with about half a million metro-area residents; other neighboring metro areas, including the City of Rio Rancho, raise that total to over 700,000 residents.

The population within an 80-kilometer/50-mile radius of SNL/NM is over 850,000 residents (DOC 2010); nine counties are contained or partially included in that radius (see Figure 1-2).

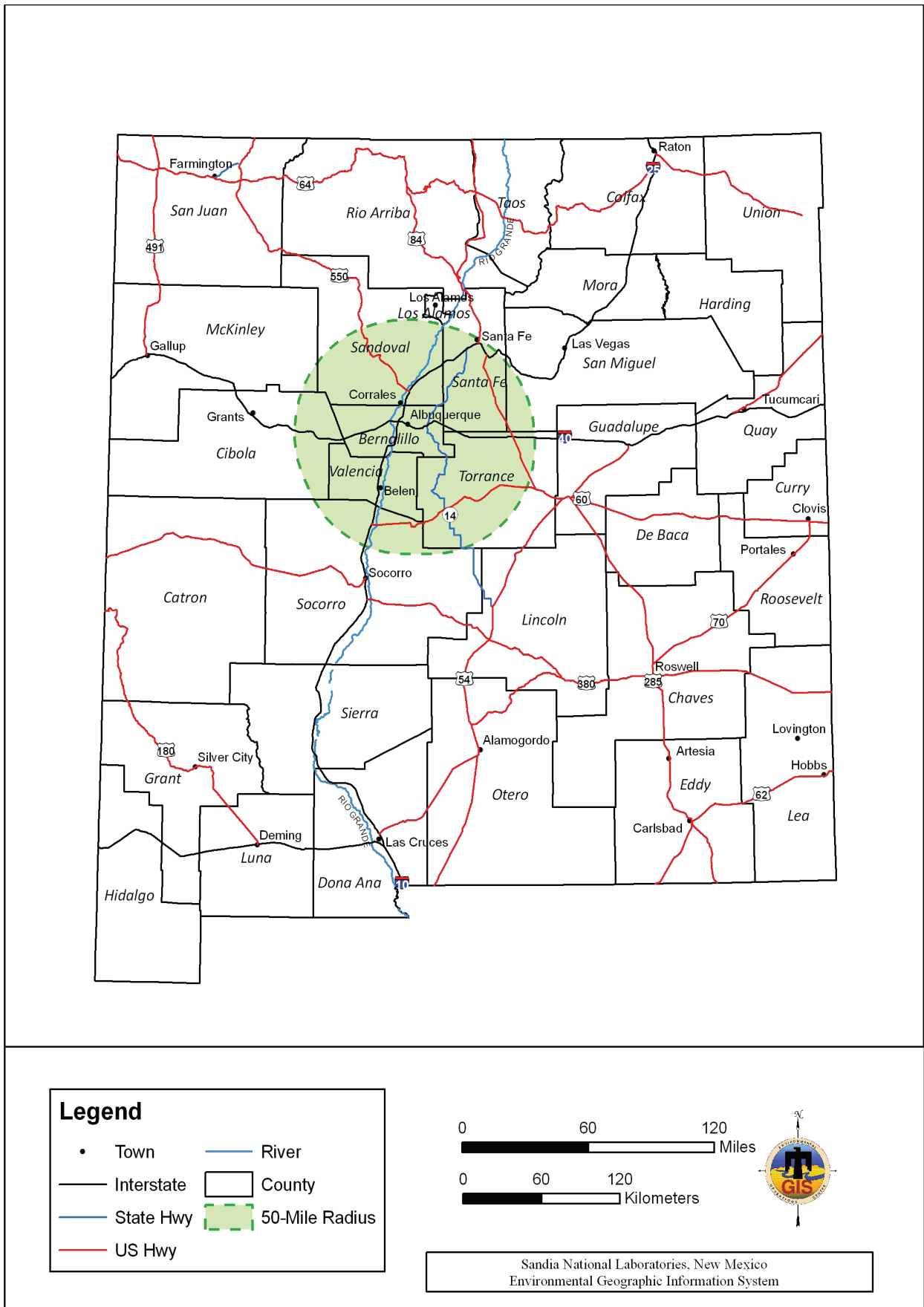
<http://www.census.gov/population/projections/SummaryTabA1.pdf>

## **1.5 Regional Geologic Setting**

The regional geologic setting in which SNL/NM and KAFB are situated has been subjected to relatively recent episodes of basaltic volcanism and ongoing regional rifting (crustal extension). The Rio Grande Rift has formed a series of connected down-dropped basins filled with sediment deposits. The Rio Grande Rift extends for about 450 miles from Leadville, Colorado into New Mexico; Albuquerque and the KAFB are within a rift valley.

### **1.5.1 Albuquerque Basin**

The Albuquerque Basin is one of several north south trending sediment-filled basins formed by the Rio Grande Rift. This major structural feature is approximately 30 miles wide, 100 miles long, and 3,000 m<sup>2</sup> in area (Grant 1982). On the east, uplifted



**FIGURE 1-2. State of New Mexico Map**

The overlay shows major roads, cities, and county lines.  
The dashed circle encompasses the 50-mile radius from SNL/NM facilities.

fault blocks manifested by the Sandia, Manzanita, and Manzano Mountains bound the basin. The western side of the basin is bound by the Lucero Uplift to the south, the Rio Puerco Fault Belt, and the Nacimiento Uplift at its northern end. There is relatively little topographic relief along the Rio Puerco Fault Belt on the northwestern side of the basin. Two rivers flow to the south drain the basin — the Rio Puerco to the west, and the Rio Grande to the east.

### **1.5.2 Regional Fault Systems**

Several faults are located on KAFB (see Figure 1-3). Tijeras Fault, which has been traced as far north as Madrid, New Mexico, trends southwesterly through Tijeras Canyon and across KAFB. Tijeras Canyon was formed by preferential erosion along the fault. The system of faults connecting with the Tijeras Fault on KAFB is collectively referred to as the Tijeras Fault Complex. The Tijeras Fault Complex marks a distinct geologic boundary between the uplifted blocks on the east and the sediment-filled basin to the west. This geologic boundary also forms a boundary between the two major groundwater regimes at KAFB. For further information on hydrological settings, see Section 1.6.

The Sandia Fault is thought to be the primary boundary between the Sandia Mountains and the Albuquerque Basin. The Sandia Fault converges with the Tijeras Fault and the Hubbell Spring Fault. Both the Sandia Fault and Hubbell Spring Fault are north-south trending, down-to-the-west, enechelon normal faults, which are Tertiary in age (63 million to 1.8 million years ago). (Lozinsky et al. 1991; Woodward 1982; Kelley 1977).

## **1.6 Hydrological Settings**

The hydrogeological system is divided into two areas separated by the Tijeras Fault Complex, which marks a distinct geological boundary (see Figure 1-4). To the east of the Tijeras Fault Complex, the geology is characterized by fractured and faulted bedrock covered by a thin layer of alluvium and shallow groundwater 45 to 325 ft deep. On the west side of the Tijeras Fault Complex, within the basin, groundwater levels range from 295 ft to 570 ft below ground surface (bgs) at KAFB.

A perched groundwater system (PGWS) overlies the regional aquifer in the north portion of KAFB. The

PGWS extends southward from TA-I to the KAFB Golf Course. The western extent of the PGWS is somewhere midway between Wyoming Boulevard and the Albuquerque Sunport's east-west runway. The eastern extent is just east of the KAFB landfill and may be bounded by the West Sandia Fault. The groundwater gradient within the PGWS is to the southeast with the depth to water approximately 270 ft bgs in the western part and 420 ft bgs in the east.

### **1.6.1 Natural Springs**

Two perennial springs are located on KAFB (Coyote Springs and Sol se Mete Spring). Additionally, there is one perennial spring (Hubbell Spring) located immediately south of the KAFB boundary on Isleta Pueblo. Numerous ephemeral springs occur within the foothills and in the eastern reach of Arroyo del Coyote.

### **1.6.2 Groundwater Production**

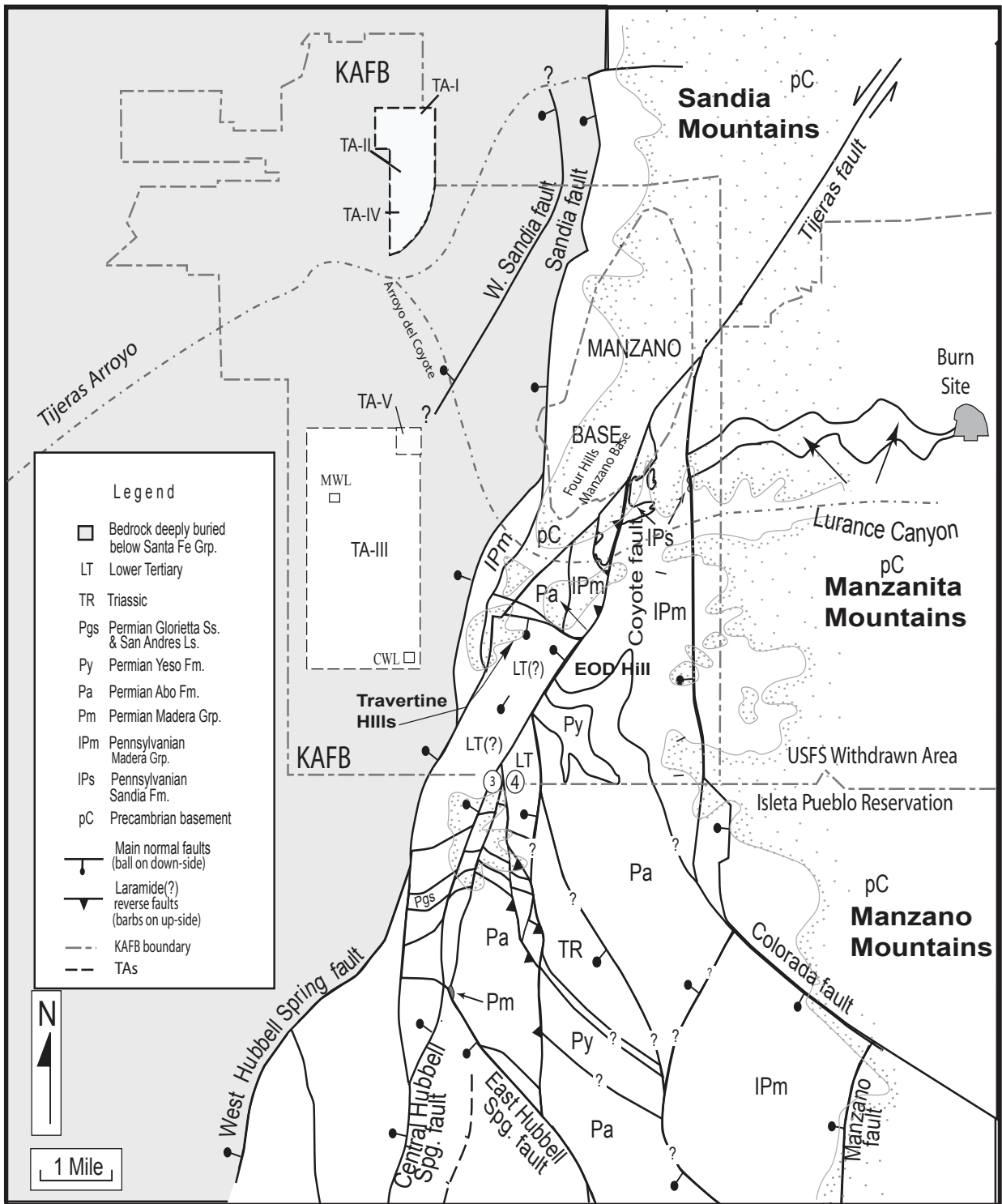
The primary regional aquifer in the Albuquerque Basin is within the upper unit and, to a lesser degree, the middle unit of the Santa Fe Group Aquifer System. Most ABCWUA water supply wells are located on the east side of the Rio Grande, which is the most productive portion of the aquifer. The highest yield wells are screened in the sediments associated with the ancestral river channel. Prior to extensive urban development in the Albuquerque area beginning in the 1950s, the direction of regional groundwater flow in the area of KAFB was primarily to the southwest. As a result of groundwater withdrawal, the local water table has dropped by as much as 141 ft (Thorn et al. 1993). Groundwater withdrawal from KAFB and ABCWUA wells at the north end of KAFB have created a trough-like depression in the water table, causing flow to be diverted northeast in the direction of the well fields.

## **1.7 Regional Climate**

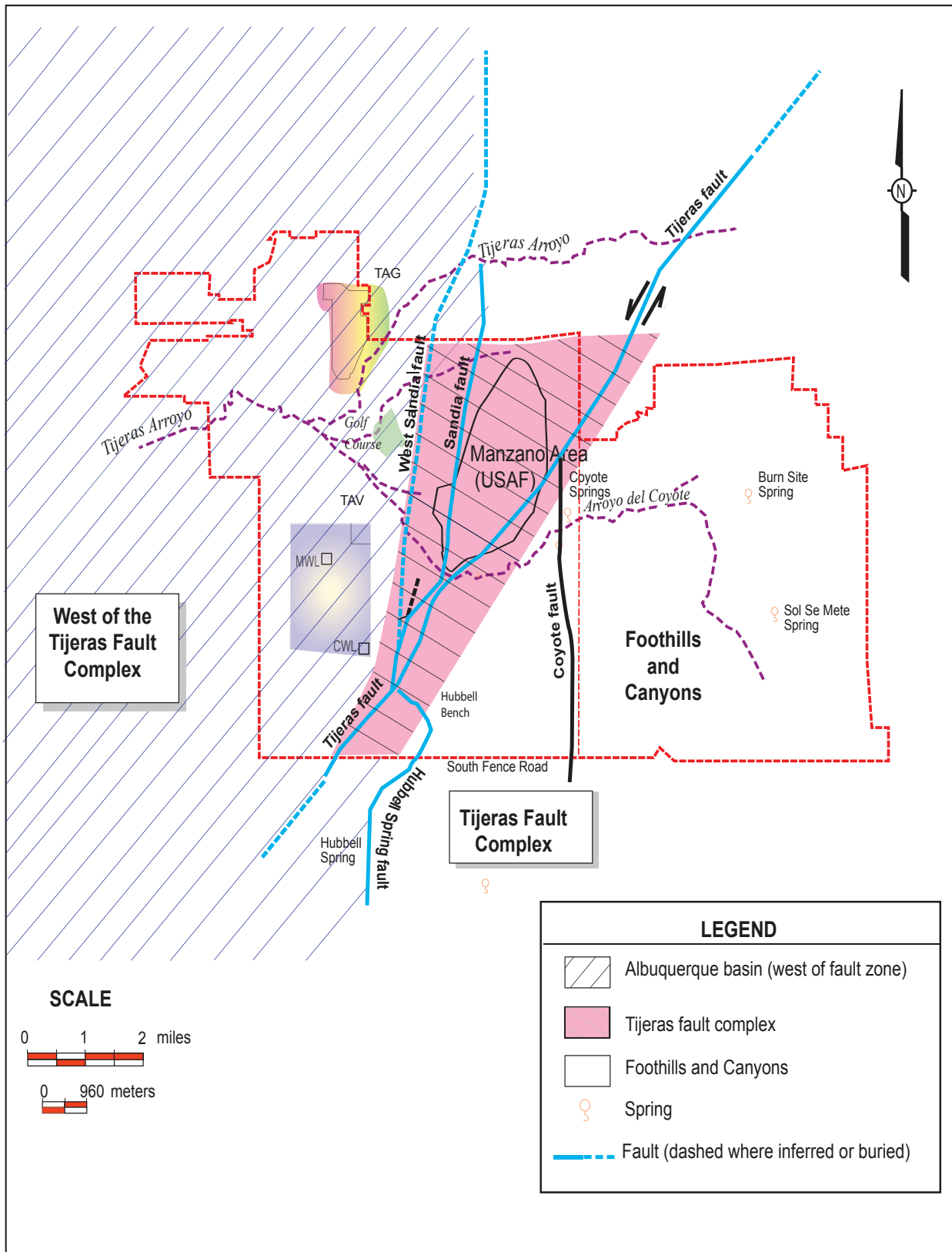
Large diurnal temperature ranges, summer monsoons, and frequent drying winds are characteristic of the regional climate in the Albuquerque Basin and the Sandia, Manzanito, and Manzano Mountains.

### **1.7.1 Temperature**

Temperatures are typical of mid-latitude dry continental climates with summer high temperatures in the basin around 90°F (degrees Fahrenheit) and







**FIGURE 1-4.** Hydrogeologically Distinct Areas at KAFB

winter high temperatures around 50°F. Daily low temperatures range from around 60°F in the summer around 20°F in the winter. The dry continental climate also produces low average humidities in the late spring and summer prior to the onset of the monsoon season. Daytime relative humidities can be between 10 and 20 percent in the spring and early summer, with an average humidity near 30 percent. Winter relative humidity averages near 50 percent.

### **1.7.2 Precipitation**

Precipitation varies across the region with many locations in the higher elevations of the mountains receiving twice the annual rainfall of locations in the Albuquerque Basin. Most precipitation falls between July and October mainly in the form of brief, heavy rain showers. Average annual precipitation, based on 10 years of data collected between 1995 and 2004, is approximately 8.5 inches at SNL/NM, with 10.9 inches in the lower foothills. Annual precipitation recorded at the National Weather Service (NWS) cooperative stations in mountain elevations varies between 10 and 23 inches. The winter season in the Albuquerque Basin and around SNL/NM is generally dry, with an average of less than 1.5 inches of precipitation falling between December and February.

### **1.7.3 Climate**

While the regional climate is described by the atmospheric state variables of temperature and humidity, site-specific meteorology at SNL/NM is influenced by the proximity to topographic features such as mountains, canyons, and arroyos. These features influence local wind patterns across the site. Canyons and arroyos tend to channel or funnel wind, whereas mountains create an upslope/downslope diurnal pattern to wind flows. Winds tend to blow toward the mountains or up the Rio Grande Valley during the day, and nocturnal winds tend to blow down the mountain towards the Rio Grande Valley. These topographically induced wind flows can be enhanced or negated by weather systems that move across the southwestern U.S. The strongest winds occur in the spring when monthly wind speeds average 10.3 miles per hour (mph). Wind gusts commonly reach 50 mph.

## **1.8 Regional Ecology**

The SNL/NM facilities area is influenced by two major physiographic provinces - mesa and plains, and mountains. The various elevations in these provinces provide a varied range of life zones on KAFB.

### **1.8.1 Physiographic Provinces**

**Mesa and Plains** - A significant portion of central New Mexico, including the middle Rio Grande and much of SNL/NM, is comprised of this physiography. Major landforms include valleys, lowlands, outwash plains, and alluvial fans and terraces. Grama and galleta grasses, four-wing saltbush, and sand sage cover lower elevations, with piñon pine and juniper species characterizing the higher elevations. Riparian areas grow in strips along water courses and include cottonwood, willow and non-native salt cedar trees.

**Mountains** - The Sandia and Manzano Mountains are south of (but not part of) the Rocky Mountains. The eastern portion of SNL/NM is located in, and bordered by, the Manzano Mountains. Vegetation in these steep, rugged mountains varies greatly on the basis of elevation and aspect. Forests tend to be patchy due to topography, weather, fire, insect outbreaks, and disease. The landscape is a complex mosaic of open meadows, composed of forest stands of varying ages and species.

These physiographic provinces each have an influence on the typical landforms, flora, and fauna predominant within the SNL/NM area. The topography at KAFB ranges from lowland grasslands to high elevation coniferous forests. With much of the area undeveloped, there is great diversity in plant and animal communities living on KAFB. At least 267 plant species and 195 animal species are found on KAFB (DOE 1999). Table 1-1 lists the most common species of birds, mammals, reptiles, amphibians, and plants that have been identified on-site.

### **1.8.2 Regional Life Zones Occurring on KAFB**

**Ponderosa Pine Forest or Transition Life Zone** (7,000 to 8,000 ft) – a closed canopy of ponderosa pine, piñon-pine, juniper, scrub oak, grassy meadows, streams, marshes, and canyons are typical of this zone.



The USFS withdrawn area in the eastern portion of KAFB reaches an elevation of just over 7,900 ft.

**Piñon-Juniper Woodland Zone** (6,000 to 7,000 ft) – a mostly open canopy of piñon-pine and juniper sparsely populate this zone of foothills and mesas. Animals typical of this woodland include the piñon mouse and piñon jay. Much of the rolling terrain in the withdrawn area is comprised of this zone.

**Upper Sonoran Life Zone** (below 6,000 ft) – this short grass prairie zone occurs on alluvial fans, mesas, and gently rolling or sloping plains. Pioneer plants include tumbleweed, goat head, and spurge; intermediate plants include galleta and burro grass, cactus, and mixed weeds; climax vegetation is grama

grass. Animals include prairie dogs, burrowing owls, and kangaroo rats. The non-withdrawn area of KAFB land falls within this zone (see Figure 1-1).

## 1.9 Ecological Footprint of SNL/NM

The SNL/NM Ecological Footprint Model (EFM) quantifies the environmental impacts associated with energy, transportation, waste, and land use at SNL/NM for Fiscal Year (FY) 2005 through FY 2009 by incorporating local emission factors, when applicable and available, and data derived from SNL/NM operations (see page 1-13).

TABLE 1-1. Common Plants and Animals Identified at KAFB

BIRDS			
American robin	<i>Turdus migratorius</i>	Horned lark	<i>Eremophila alpestris</i>
American kestrel	<i>Falco sparverius</i>	Killdeer	<i>Charadrius vociferus</i>
Black-chinned hummingbird	<i>Archilochus alexandris</i>	Loggerhead shrike	<i>Lanius ludovicianus</i>
Black-headed grosbeak	<i>Pheucticus melanocephalus</i>	Mountain bluebird	<i>Sialia currucoides</i>
Broad-tailed hummingbird	<i>Selasphorus platycercus</i>	Red-tailed hawk	<i>Buteo jamaicensis</i>
Dark-eyed junco	<i>Junco hyemalis</i>	Rufous-sided towhee	<i>Pipiloerythro melanocephalus</i>
MAMMALS			
Black bear	<i>Ursus americanus</i>	Deer mouse	<i>Peromyscus maniculatus</i>
Bobcat	<i>Felis rufus</i>	Gunnison's prairie dog	<i>Cynomys gunnisoni</i>
Banner-tailed kangaroo rat	<i>Dipodomys spectabilis</i>	Gray fox	<i>Urocyon cinereoargenteus</i>
Black-tailed jackrabbit	<i>Lepus californicus</i>	Mule deer	<i>Odocoileus hemionus</i>
Desert cottontail	<i>Sylvilagus audubonii</i>		
REPTILES AND AMPHIBIANS			
Collared lizard	<i>Crotaphytus collaris</i>	Great plains skink	<i>Eumeces obsoletus</i>
Chihuahuan spotted whiptail	<i>Aspidoscelis exsanguis</i>	Great plains toad	<i>Bufo cognatus</i>
Round-tailed horned lizard	<i>Phrynosoma modestum</i>	Western diamondback rattlesnake	<i>Crotalus atrox</i>
Prairie lizard	<i>Sceloporus consobrinus</i>	Side-blotched lizard	<i>Uta stansburiana</i>
Gopher snake	<i>Pituophis catenifer</i>	Short-horned lizard	<i>Phrynosoma hernandesi</i>
PLANTS			
Apache plume	<i>Fallugia paradoxa</i>	Goathead	<i>Tribulus terrestris</i>
One-seed juniper	<i>Juniperus monosperma</i>	India ricegrass	<i>Achnatherum hymenoides</i>
New Mexico needlegrass	<i>Hesperostipa neomexicana</i>	Ring muhly	<i>Muhlenbergia torreyi</i>
Purple three-awn	<i>Aristida purpurea</i>	Bush muhly	<i>Muhlenbergia porteri</i>
Shrub live oak	<i>Quercus turbinella</i>	Soapweed yucca	<i>Yucca glauca</i>
Spectacle pod	<i>Dithyrea wislizenii</i>	Black grama	<i>Bouteloua eriopoda</i>

In 2008, the EMS team calculated the ecological footprint of SNL/NM's campus, to quantify the environmental impact of energy use, transportation, waste, land use, and water consumption. The baseline analysis was completed for FY 2005 by incorporating local emission factors and data derived from SNL/NM operations. Refer to the following webpage for more information:

<http://environment.sandia.gov/new/footprint.shtml>

Since this baseline calculation was completed, a model has been created to enable FY 2006-2009 data to be input and an ecological footprint to be automatically calculated. This EFM, which is currently being used by other national laboratories, federal agencies, and universities, can help Sandia and other organizations identify and evaluate environmental aspects and impacts and can aid in developing objectives and measurable targets to mitigate those impacts. The EFM is ultimately designed to gauge the environmental consequences associated with the numerous and diverse operations at SNL/NM.

An ecological footprint is the summation of the carbon footprint and the land use footprint. Carbon dioxide (CO<sub>2</sub>), nitrous oxide (N<sub>2</sub>O) and methane (CH<sub>4</sub>) are included in the model; N<sub>2</sub>O and CH<sub>4</sub> are normalized to a carbon dioxide equivalent (CO<sub>2</sub>e), based on their global warming potentials. The carbon footprint is then determined by calculating how much land is required to sequester the CO<sub>2</sub>e emissions from SNL/NM operations. The land use footprint is determined by summing the total developed land area under SNL/NM control.

The EFM expresses the carbon and ecological footprints of SNL/NM in global hectares (gha) of the world's average biologically productive land, as well as local hectares (lha) of the regional landscape. The units of lha are unique to the Pinyon-Juniper woodland and desert grassland landscape. The EFM also accounts for the CO<sub>2</sub> sequestration capacity of undeveloped land, giving Sandia credit for keeping the natural landscape intact.

The majority of SNL/NM's carbon footprint is attributable to electricity use (91 percent in FY 2009). A large increase in electricity use in FY 2007 resulted in a significant increase in the overall footprint that same year (Table 1-2). Electricity use decreased in FY 2008 and dropped even further in FY 2009. This decrease, coupled with a slight decrease in New Mexico grid electricity emissions factors helped to reduce our electricity footprint by three percent in FY 2009 compared to FY 2005. However, electricity continues to be the largest contribution to SNL/NM's carbon footprint. In order to make a meaningful reduction in our footprint, we must reduce energy consumption, increase energy efficiency, and promote renewable alternatives to NM's coal-fired grid production.

TABLE 1-2. SNL/NM Carbon Footprint Over Time

Group	Resource	Tonnes CO <sub>2</sub> e				
		FY 2005	FY 2006	FY 2007	FY 2008	FY 2009
Energy	Electricity	352,691	359,578	390,103	359,699	342,080
	Natural gas	28,715	28,929	31,100	23,945	20,136
	Stationary Combustion	160	689	205	97	98
Transportation	Commuting	22,961	25,250	23,881	24,025	23,200
	Rental Cars	2,890	3,214	2,518	2,748	2,612
	Fleet	2,252	1,790	1,576	1,432	1,432
	Airline Travel	13,317	12,845	12,845	12,845	10,757
Waste	Waste	7,632	43,112	-3,170	-8,566	-20,876
	Sequestration	-1,504	-1,504	-1,504	-1,504	-1,504
	<b>Carbon Footprint</b>	<b>429,115</b>	<b>430,792</b>	<b>457,554</b>	<b>414,722</b>	<b>377,936</b>

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# 2.0 Compliance Summary

Sandia Corporation (Sandia) conducts operations based on environmental regulations, statutes, and U.S. Department of Energy (DOE) directives through a variety of programs at Sandia National Laboratories, New Mexico (SNL/NM) that work together to pursue complete compliance with applicable regulations. As a part of these federal, state, and local mandates, Sandia adheres to strict reporting and permitting requirements.

This chapter summarizes Sandia's compliance status with major environmental regulations, statutes, and DOE directives that are applicable to operations conducted at SNL/NM (see page 2-3 and Section 2.1.16). Compliance issues, corrective actions, environmental occurrences, and environmental audits and appraisals are also discussed in this chapter.

Current permits held by Sandia, DOE, the National Nuclear Security Administration (NNSA), and the Sandia Site Office (SSO) are listed in Chapter 9.

## ***Compliance Order on Consent (COOC)***

On April 29, 2004, the New Mexico Environment Department (NMED), DOE, and Sandia entered into the COOC. The COOC provides requirements and establishes schedules and deliverables for corrective action pursuant to the New Mexico Hazardous Waste Act (NMHWA) and the New Mexico Solid Waste Act (NMSWA).

## ***Compliance Agreement (CA)***

A CA was signed by the City of Albuquerque (COA) and DOE in 2005 that requires and establishes schedules and deliverables for Steam Plant testing and reporting. The CA is mandated by and through the Environmental Health Department (EHD), which is authorized by the COA, Bernalillo County, and the Albuquerque Bernalillo County Air Quality Control Board (ABC/AQCB). The boilers at the Steam Plant were all decommissioned during Calendar Year (CY) 2009. More detail is provided in Chapter 5. Therefore the CA that was in place no longer applies or is needed.

## ***Federal Facilities Compliance Order (FFCO)***

On October 4, 1995, NMED, DOE, and Sandia entered into the FFCO, which was developed pursuant to the Federal Facilities Compliance Act. The FFCO provides requirements for achieving compliance with the requirements of Title 40 of the Code of Federal Regulations (CFR), Part 268.50 for mixed hazardous/radioactive waste at SNL/NM.

## **2.1 Compliance Status with Federal Regulations**

Most environmental regulations and statutes applicable to SNL/NM are shown on page 2-3 including links to associated web sites. The following subsections detail the regulations.

### **2.1.1 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)**

The CERCLA, commonly referred to as the "Superfund," provides cleanup funds and/or assessment requirements for inactive waste sites at all federal facilities. A Preliminary Assessment/Site Inspection (PA/SI), as required by CERCLA, was performed at SNL/NM in 1988. This inspection confirmed that Sandia does not own any sites that would qualify for the National Priorities List (NPL), which lists the nation's high priority cleanup or "Superfund" sites. Therefore, with respect to inactive hazardous waste sites, Sandia has no CERCLA reporting requirements. Amendments under the Superfund Amendments and Reauthorization Act (SARA) require additional reporting in the event of a reportable quantity (RQ) release. Sandia was in full compliance with CERCLA/SARA in 2009, as illustrated in this chapter.

## 2.1.2 Emergency Planning and Community Right-to-Know Act (EPCRA)

The EPCRA, also known as SARA Title III, establishes emergency planning requirements for federal, state, and local governments and industry.

EPCRA ensures that communities have the right to know about and be informed of potential hazards including the type and location of large quantities of toxic chemicals used and stored by facilities in or near the community. EPCRA specifically mandates that chemical information be made available to local emergency response organizations, such as fire departments and hospitals. Any inadvertent release must be reported to appropriate state and local authorities. All subsequent reports must be made accessible to the public. The four major reporting requirements designated by specific sections of EPCRA are shown in Table 2-1.

Information on EPCRA can be found at the following U.S. Environmental Protection Agency (EPA) website:

<http://www.epa.gov/emergencies/content/epcra>

## Toxic Release Inventory (TRI) Reporting

EPCRA regulations require that facilities with activities described in the Standard Industrial Classification (SIC) Codes 20 through 39 that use toxic chemicals listed in SARA Title III over a threshold value must submit a TRI report. The threshold value for listed chemicals requiring a TRI report is 10,000 pounds per year (lb/yr), unless otherwise specified.

Each year, nearly 23,000 facilities report to the EPA under the TRI Program. The proposed TRI Reporting Forms Modification Rule (1674 Federal Register/ Vol. 70, No. 6/ Monday, January 10, 2005) sought comment on eliminating certain information from the reports, simplifying other reporting data, and, in some cases, reducing duplicate data collection efforts. The options being proposed reduce the cost of compiling and submitting TRI reports, while maintaining the quality and practical utility of the TRI data. This rule became effective on September 12, 2005.

In 2009, chemical use at SNL/NM was above the reporting threshold for submitting a TRI report for lead. Sandia continues to document its toxic chemical use in the *Chemical Inventory Report Calendar Year (CY) 2009* (SNL 2010b), which documents all purchases of chemicals at SNL/NM, Tonopah Test Range (TTR),

**TABLE 2-1. 2009 SARA Title III (or EPCRA) Reporting Requirements Applicable to SNL/NM**

Section	SARA Title III Section Title	Requires Reporting?		Description
		Yes	No	
302 - 303	Emergency Planning	Yes		Sandia submits an annual report listing chemical inventories above the reportable Threshold Planning Quantities listed in 40 CFR Part 355 Appendix B, the location of the chemicals, and emergency contacts. The report is prepared for the DOE/NNSA/SSO, which distributes it to the required entities.
304	Emergency Notification		No	There was no reportable RQ release in 2009.
311-312	Hazardous Chemical Storage Reporting Requirements	Yes		There are two "Community Right-to-Know" reporting requirements: (a) Sandia completes the EPA Tier II forms for all hazardous chemicals present at the facility at any one time in amounts equal to or greater than 10,000 lb and for all extremely hazardous substances present at the facility in an amount greater than or equal to 500 lb or the Threshold Planning Quantity, whichever is lower; (b) Sandia provides MSDSs for each chemical entry on a Tier II form unless it decides to comply with the EPA's alternative MSDS reporting, which is detailed in 40 CFR Part 370.21.
313	Toxic Chemical Release Forms	Yes		Sandia was above the reporting thresholds for CY 2009 for submitting a TRI Report for lead. A majority of the lead was from the use of lead-containing solders for laboratory benchmark solders.

**NOTES:** SARA = Superfund Amendments and Reauthorization Act  
CFR = Code of Federal Regulations  
DOE = U.S. Department of Energy  
NNSA = National Nuclear Security Administration  
SSO = Sandia Site Office  
MSDS = Material Safety Data Sheets  
(gives relevant chemical information)  
EPCRA = Emergency Planning and Community Right-to-Know Act

RQ = reportable quantity  
Sandia = Sandia Corporation  
EPA = U.S. Environmental Protection Agency  
lb = pounds  
CY = Calendar Year  
TRI = Toxic Release Inventory  
SNL/NM = Sandia National Laboratories, New Mexico



## Major Environmental Regulations & Statutes Applicable to SNL/NM

Regulation/Statute	Description	Where to go for more information
Atomic Energy Act (AEA)	Directs U.S. Department of Energy (DOE) and the U.S. Nuclear Regulatory Commission (NRC) in the management of nuclear materials and radioactive waste	<a href="http://www.hss.energy.gov/nuclearsafety/env/policy/">http://www.hss.energy.gov/nuclearsafety/env/policy/</a>
Clean Air Act (CAA) and CAA Amendments (CAAA)	Provides standards to protect the nation's air quality	<a href="http://www.epa.gov/air/caa/">http://www.epa.gov/air/caa/</a>
Clean Water Act (CWA)	Provides general water quality standards to protect the nation's water sources and byways	<a href="http://www.epa.gov/region6/water/">http://www.epa.gov/region6/water/</a>
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)	Provides federal funding for cleanup of inactive waste sites on the National Priorities List (NPL) and mandates requirements for reportable releases of hazardous substances	<a href="http://www.epa.gov/lawsregs/laws/cercla.html">http://www.epa.gov/lawsregs/laws/cercla.html</a>
Cultural Resources Acts	Includes various acts that protect archeological, historical, religious sites, and resources	<a href="http://recreation.usgs.gov/env_guide/cultural.html">http://recreation.usgs.gov/env_guide/cultural.html</a>
Endangered Species Act (ESA)	Provides special protection status for federally listed endangered or threatened species.	<a href="http://www.epa.gov/lawsregs/laws/esa.html">http://www.epa.gov/lawsregs/laws/esa.html</a>
Executive Orders (EOs)	Several EOs provide specific protection for wetlands, floodplains, environmental justice in minority and low-income populations, and encourages greening the government through leadership in EM	<a href="http://www.archives.gov/federal-register/executive-orders/disposition.html">http://www.archives.gov/federal-register/executive-orders/disposition.html</a>
Federal Facility Compliance Act (FFCA)	Directs federal agencies regarding environmental compliance	<a href="http://www.hss.energy.gov/nuclearsafety/env/policy/">http://www.hss.energy.gov/nuclearsafety/env/policy/</a>
Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)	Controls the distribution and use of various pesticides	<a href="http://www.epa.gov/lawsregs/laws/fifra.html">http://www.epa.gov/lawsregs/laws/fifra.html</a>
Migratory Bird Treaty Act (MBTA) of 1918	Prevents the taking, killing, possession, transportation and importation of migratory birds, their eggs, parts, and nests	<a href="http://www.fws.gov/migratorybirds/RegulationsPolicies/treatlaw.html#mbta">http://www.fws.gov/migratorybirds/RegulationsPolicies/treatlaw.html#mbta</a>
National Emission Standards for Hazardous Air Pollutants (NESHAP)	Specifies standards for radionuclide air emissions and other hazardous air releases under the CAA	<a href="http://www.epa.gov/radiation/neshaps/">http://www.epa.gov/radiation/neshaps/</a>
National Environmental Policy Act (NEPA)	Requires federal agencies to review all proposed activities so as to include environmental aspects in agency decision-making	<a href="http://nepa.energy.gov/">http://nepa.energy.gov/</a>
Resource Conservation and Recovery Act (RCRA)	Mandates the management of solid and hazardous waste and certain materials stored in underground storage tanks (USTs).	<a href="http://www.epa.gov/lawsregs/laws/rcra.html">http://www.epa.gov/lawsregs/laws/rcra.html</a>
Safe Drinking Water Act (SDWA)	Enacts specific health standards for drinking water sources	<a href="http://www.epa.gov/safewater/sdwa/sdwa.html">http://www.epa.gov/safewater/sdwa/sdwa.html</a>
Superfund Amendments and Reauthorization Act (SARA)	SARA, Title III, also known as the Emergency Planning and Community-Right-to-Know Act (EPCRA), mandates communication standards for hazardous materials over a threshold amount that are stored or used in a community	<a href="http://www.epa.gov/lawsregs/laws/epcra.html">http://www.epa.gov/lawsregs/laws/epcra.html</a>
Toxic Substance Control Act (TSCA)	Specifies rules for the manufacture, distribution, and disposal of specific toxic materials such as asbestos and polychlorinated biphenyls (PCBs)	<a href="http://www.epa.gov/compliance/civil/tsca/index.html">http://www.epa.gov/compliance/civil/tsca/index.html</a>

and Kauai Test Facility (KTF) for CY 2009. This chemical inventory supports compliance with SARA Title III, as well as reporting for COA inventory requirements.

### **2.1.3 Resource Conservation and Recovery Act (RCRA)**

RCRA regulates the generation, transportation, treatment, storage, and disposal (TSD) of hazardous chemical waste and non-hazardous solid wastes, and the storage of hazardous or petroleum products in underground storage tanks (UST). Under the authority of the NMHWA, and with delegated authority from the EPA under RCRA, the NMED administers hazardous and solid waste regulatory programs in New Mexico. Hazardous and solid waste management activities at SNL/NM are conducted under NMED regulations. Some additional RCRA requirements and EPA regulations also apply. Applicable regulations are listed in Chapter 9.

The hazardous component of hazardous/radioactive mixed waste (MW) is regulated as hazardous waste and subject to the requirements of state and federal regulations. The radioactive component of MW is regulated under the Atomic Energy Act (AEA) of 1946.

Sandia generates hazardous waste and MW through normal operations and through its ongoing environmental restoration (ER) project, which is responsible for the cleanup of sites that were formerly used for operations such as testing and disposal. Sandia currently implements an active and successful program to minimize hazardous waste and MW through product substitutions, process changes, material re-use, and recycling. For a summary of Sandia's hazardous waste management activities during 2009 see Chapter 3.

**Operating Permits** – Sandia and DOE/NNSA/SSO operate hazardous waste management units at SNL/NM under the following permits issued by NMED:

- Hazardous Waste Management Facility (HWMF), Permit NM5890110518-1,
- Thermal Treatment Facility (TTF), Permit NM5890110518-2, and
- Corrective Action Management Unit (CAMU), Permit NM5890110518-1, Module IV.

On February 6, 2002, Sandia and DOE/NNSA/SSO submitted a comprehensive RCRA Part B request to renew the operating permits for these units. The request included updated permit applications for nine MW management units: the Radioactive and Mixed Waste Management Facility (RMWMF), the High Bay Waste Storage Facility (HBWSF), the seven Manzano Storage Bunkers (MSB) and new application request for operation of the Auxiliary Hot Cell Facility (AHCF). Sandia and DOE/NNSA/SSO continue to operate under the existing permits and under interim status during the permit application and renewal process. The HBWSF and two of the seven MSB were withdrawn from the permit application in 2003, and closure of those units was completed in 2006. Treatment operations were completed at the CAMU in 2003. Closure of the unit was completed later that year, and DOE/NNSA/SSO and Sandia currently conduct post-closure care and maintenance, as detailed in Section 3.2.2.

On August 20, 2007, NMED issued a draft operating permit to DOE/NNSA/SSO and Sandia and invited public comments. DOE/NNSA/SSO, Sandia, and several citizens submitted comments to NMED. During 2009, NMED met with interested commenters to discuss their comments and propose modifications to the draft permit.

**Classified Waste Landfill** – The Classified Waste Landfill was used to store non-hazardous classified media (e.g. floppy disks) and components. Sandia and DOE/NNSA/SSO, instead of seeking permit coverage, plan to excavate the contents of the landfill and revegetate the area. A draft excavation plan was approved by NMED on April 6, 2010.

**Post-Closure Care Permit, Chemical Waste Landfill (CWL)** – The CWL was used for hazardous waste disposal under interim status until 1985. From 1981 to 1989, the CWL was also used for storage of hazardous wastes in drums. Waste management operations ceased and closure activities began in 1989. Closure included two voluntary corrective measures (VCM): extraction of solvent vapors (primarily trichloroethylene) and excavation of the entire landfill. Sandia and DOE/NNSA/SSO submitted a post-closure care plan (PCCP) in 2005, and submitted additional permit materials in March 2007. Details about closure and post-closure care activities are detailed in Section 3.2.2.



On October 15, 2009, NMED issued a final post-closure care permit and a notice of approval for the final remedy and closure plan amendment. The permit will become effective when the NMED issues written approval of DOE/NNSA/SSO and Sandia's certification of the closure of the CWL.

#### **2.1.4 Federal Facility Compliance Act (FFCA)**

The FFCA requires federal facilities to comply with all federal, state, and local requirements for hazardous and solid waste, including full compliance with the restrictions and prohibitions on extended storage of wastes that do not meet the applicable hazardous waste treatment standards. On October 4, 1995, NMED, DOE/NNSA/SSO, and Sandia entered into a FFCO for management of MW in extended storage at SNL/NM. A general *Site Treatment Plan (STP)* (SNL 2010d) and a schedule for processing the waste were developed. In 2009, Sandia continued to characterize and treat MW and to package wastes for shipment to permitted off-site TSD facilities. Sandia met all of the milestones outlined in the STP.

#### **2.1.5 Atomic Energy Act (AEA)**

In 1946, the AEA was enacted to encourage the development and use of nuclear energy for general welfare, common defense, and security. The purpose of the AEA is to assure the proper management of nuclear materials and radioactive waste. The AEA, as amended, delegates control of nuclear energy and nuclear materials primarily to DOE/NNSA/SSO, the U.S. Nuclear Regulatory Commission (NRC) and the EPA. Federal regulations control radioactive emissions and the transportation of nuclear materials. The authority for controlling radioactive waste is retained by DOE/NNSA/SSO and governed by DOE directives.

#### **2.1.6 Clean Air Act (CAA) and Clean Air Act Amendments (CAAA) of 1990**

The objectives of the CAA and the CAAA are to protect and enhance the nation's air quality. The EPA is responsible for describing and regulating air pollutants from stationary and mobile sources and for setting ambient air quality standards. The COA has direct delegation from EPA Region VI to locally administer these standards as well as specific air emission permits and registrations, as shown in Chapter 9, Table 9-1.

The CAA requires the EPA to develop a list of air pollutants from all sources that could harm public health or the environment. The EPA identified six substances as "criteria pollutants" and subsequently developed National Ambient Air Quality Standards (NAAQS) for these pollutants.

The EPA program for the attainment and maintenance of NAAQS requires local agencies to develop a comprehensive permitting program. The Air Quality Control Board (AQCB) has developed a set of regulations governing mobile and stationary sources of air pollution.

In addition to the regulations for criteria pollutants, the EPA's National Emission Standards for Hazardous Air Pollutants (NESHAP) Program prescribes emission limitations for hazardous air pollutants (HAP).

##### ***Radiological NESHAP***

Subpart H of 40 CFR 61 specifically regulates radionuclide emissions (other than radon) from DOE facilities. As required by the regulation, Sandia calculates an annual dose from actual or calculated emissions to potentially exposed members of the public. The regulation requires that Sandia determine the maximum possible dose that could be delivered to an individual residing at a nearby location 24 hours-per-day. The result is the effective dose equivalent (EDE) to the maximally exposed individual (MEI). The dose is compared to the EPA standard of 10 millirem per year (mrem/yr) allowed from radioactive air emissions from a DOE facility.

In 2009, the on-site MEI dose of 1.05 E-03 mrem/yr at the Honeywell Systems Support Site resulted primarily from releases of tritium from the nearby Neutron Generator Facility (NGF) in TA-I. The off-site MEI was located at the Eubank Gate Area. The MEI of 4.76 E-04 mrem/yr at the Eubank Gate Area resulted also primarily from releases of tritium from the NGF in TA-I. Both doses are well below the 10 mrem/yr EPA standard. For perspective, the annual radiation dose from natural background radiation is approximately 360 mrem/yr. Sandia met all NESHAP compliance requirements in 2009.

##### ***Fugitive Dust Permitting***

The COA enforces 20.11.20 New Mexico Administrative Code (NMAC) to ensure that all persons conducting active operations that result in disturbed surface areas, or that involve bulk material

handling, use reasonably available control measures (or other effective measures) on an ongoing basis to prevent or abate injury to human health, animal and plant life, and to prevent or abate unreasonable interference with public welfare, visibility, and the reasonable use of property.

#### ***National Emissions Inventory (NEI)***

As required by the Consolidated Emission Reporting Rule (CERR), 67 Federal Register (FR) 39602, the emission inventory requests annual emissions of volatile organic compounds (VOC), nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO), sulfur dioxide (SO<sub>2</sub>), lead (Pb), ammonia (NH<sub>3</sub>), particulate matter with a diameter of equal to or less than 10 microns (PM<sub>10</sub>), particulate matter with a diameter of equal to or less than 2.5 microns (PM<sub>2.5</sub>), and HAPs.

#### ***New Source Review (NSR) Requirements***

The NSR permitting program was established as part of the 1977 CAAA.

NSR requirements provide assurance to the public that any large, new, or modified industrial source in their neighborhood will be protective of human health and the environment, and that advances in pollution control occur concurrently with industrial expansion.

#### ***New Source Performance Standard (NSPS) Requirements***

As part of an effort to control pollution in the U.S., the EPA provides NSPS requirements that dictate the level of pollution that a new stationary source may produce. These standards are authorized by Section 111 of the CAA, and the regulations are published in 40 CFR Part 60. An NSPS has been established for a number of individual industrial or source categories, including boilers and generators.

#### ***Open Burn Permitting***

The COA enforces 20.11.21 NMAC to ensure that all persons conduct open burning in a manner that prevents or abates emissions that are visible and that produce noxious by-products of combustion.

#### ***Ozone Depleting Substances (ODS) Requirements***

Based on the requirements of the CAA, the EPA has established regulations that affect many aspects of the refrigeration industry.

#### ***Title V Operating Permit***

The CAAA of 1990 contained provisions under Title V requiring all existing major air emission sources to obtain an operating permit. A major source is defined as the combined emissions from any facility with the potential to emit:

- 100 tons per year (tpy) or greater of any criteria pollutant,
- 10 tpy of any HAP, or
- 25 tpy of any combination of HAPs.

Details on the applicability of Title V to SNL/NM and activities are in Section 5.2.

#### ***2.1.7 Clean Water Act (CWA)***

The CWA establishes guidelines to protect the “Waters of the U.S.” by regulating the discharge of pollutants. At SNL/NM, the CWA applies to sanitary and septic system wastewater effluents, storm water runoff, and surface water discharges.

The CWA is implemented through local, state, and federal water quality standards as follows:

- (1) the Albuquerque Bernalillo County Water Utilities Authority (ABCWUA) administers regulations for sanitary sewer discharges based on federal pretreatment standards,
- (2) the EPA and the NMED administer regulations concerning oil storage and surface discharges, and
- (3) the EPA has authority over NPDES permits.

#### ***New Mexico Stream Standards***

EPA Region VI is the permitting agency for discharges under the National Pollutant Discharge Elimination System (NPDES). NMED Surface Water Quality Bureau assists EPA in regulation of storm water discharges by performing inspections on behalf of EPA and by serving as a local point of contact for providing information to permit holders. New Mexico has enacted “Standards for Interstate and Intrastate Surface Waters” (20.6.4 NMAC) to protect the quality of surface waters in the state.

### ***ABCWUA Sewer Discharge Regulations***

There are six wastewater monitoring stations, or outfalls, operating under the ABCWUA permits at SNL/NM. During 2009, there were no reported events that exceeded permitted limits established by the ABCWUA.

### ***Surface Discharge***

All discharges made to the ground or to containment areas must be evaluated for compliance with regulations implemented through the New Mexico Water Quality Control Commission (NMWQCC) standards for the protection of ground waters and surface waters prior to discharge. Sandia reviewed and approved 24 one-time internal surface discharge permits in 2009. Sandia also investigated nine reportable environmental releases that met NMED reporting standards. Detailed information regarding these releases can be found in Section 2.2.2 and Section 6.2.2. Sandia maintains two evaporation lagoons in TA-IV which are permitted by NMED Discharge Permit (DP-530). The TA-IV lagoons are used to contain and evaporate accumulated storm water pumped from the secondary containment areas around seven oil tanks that support the pulsed power accelerators. All permit conditions for the TA-IV permitted lagoons were met in 2009. The current permit for DP-530 was re-issued on September 12, 2007 and will expire on September 12, 2012.

### ***NPDES***

NPDES implements the requirements that are specific to all discharges made to “Waters of the U.S.” as defined in the CWA and “Surface Waters of the State” and as defined in New Mexico’s “Standards for Interstate and Intrastate Surface Waters” (20.6.4 NMAC). At SNL/NM, all point sources discharge to either state or federal waters and are evaluated for compliance with their respective regulations.

Historically, collecting visual and analytical samples at SNL/NM has been a challenge due to Albuquerque’s climate. Analytical sampling was not required in CY 2009, but visual assessments are conducted, sufficient runoff permitting. However, as a best management practice (BMP), environmental surveillance sampling was done (see Section 6.3.4).

### ***2.1.8 Safe Drinking Water Act (SDWA)***

The SDWA authorizes the EPA to set national standards for drinking water sources, treatment systems, and water distribution. These standards are

promulgated by the EPA as primary and secondary drinking water regulations. Specific drinking water quality criteria are established to protect human health, which limits the maximum contaminant level (MCL) of specific organic and inorganic chemical substances and biological organisms in potable water.

### ***Drinking Water Supply at SNL/NM***

Potable water for most facilities on Kirtland Air Force Base (KAFB) (including SNL/NM) is provided by the KAFB Water System. The system derives its water from deep groundwater wells (discussed in Section 7.3, Groundwater Levels). KAFB routinely samples its water and conducts analyses to establish that its water quality conforms to EPA standards. In support of KAFB compliance with NMED Drinking Water Standards, DOE/NNSA/SSO and Sandia operates the water distribution system on their property in conformance with the SDWA regulations. DOE/NNSA/SSO and Sandia provide KAFB with an annual certification that all backflow preventers installed in the potable water distribution system have been properly tested and maintained.

Information on the KAFB Water System is located on the EPA’s SDWA website, which details the compliance status for all drinking water systems in the U.S. :

<http://www.epa.gov/safewater>

Specific water quality data and system performance are published by KAFB in the Annual Consumer Confidence Report on the Quality of Drinking Water.

### ***2.1.9 Toxic Substances Control Act (TSCA)***

TSCA provides regulations regarding the import, export, use, and disposal of specifically listed toxic chemicals. At SNL/NM, compliance with TSCA primarily involves the handling and disposal of polychlorinated biphenyls (PCB). Sandia was in full compliance with TSCA in 2009. Details related to TSCA are in Section 3.4.1.

### ***2.1.10 Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)***

FIFRA regulates pesticide use and is enforced under the New Mexico Pesticide Control Act. Sandia’s Biological Control Activity compiles information on

pesticide use at SNL/NM, as discussed in Section 3.6. Sandia was in full compliance with FIFRA in 2009.

### 2.1.11 National Environmental Policy Act (NEPA)

NEPA requires federal agencies (and other organizations that perform federally sponsored projects) to consider environmental issues associated with proposed actions, be aware of the potential environmental impacts associated with these issues, and include this information in early project planning and decision making. Additionally, if a proposed action is not within a class of actions previously determined to have environmentally “insignificant” impacts, the agency must prepare an environmental assessment (EA) or an environmental impact statement (EIS) before making an irretrievable commitment of resources or funding.

Although a major objective of NEPA is to preserve the environment for future generations, the law does not require an agency to choose a course of action with the least environmental impacts. Details are provided in Section 3.7.

### 2.1.12 Endangered Species Act (ESA)

The ESA ensures that any action authorized, funded, or carried out by a party will not jeopardize the continued existence of a “threatened or endangered species” or result in adverse modifications to its habitat. At SNL/NM, ESA compliance is coordinated through NEPA reviews and the Ecology Program. Table 2-2 lists the threatened and endangered species potentially occurring in Bernalillo County.

**TABLE 2-2.** Threatened and Endangered Species Potentially Occurring in Bernalillo County, NM

Species		Federal Status	State Status	Observed at KAFB
<b>Mammals</b>				
Spotted bat	<i>Euderma maculatum</i>	---	Threatened	
New Mexican jumping mouse	<i>Zapus hudsonius luteus</i>	Candidate	Endangered	
<b>Fish</b>				
Rio Grande silvery minnow	<i>Hybognathus amarus</i>	Endangered	Endangered	
<b>Birds</b>				
Baird's sparrow	<i>Ammodramus bairdii</i>	---	Threatened	
Western burrowing owl	<i>Athene cunicularia hypugea</i>	SOC	---	
Common black-hawk	<i>Buteogallus anthracinus anthracinus</i>	---	Threatened	
Yellow-billed cuckoo	<i>Coccyzus americanus</i>	Candidate	---	
Broad-billed hummingbird	<i>Cynanthus latirostris magicus</i>	---	Threatened	
Southwest willow flycatcher	<i>Empidonax traillii extimus</i>	Endangered	Endangered	
Aplomado falcon	<i>Falco femoralis septentrionalis</i>	Endangered	Endangered	
American peregrine falcon	<i>Falco peregrinus anatum</i>	---	Threatened	X
Arctic peregrine falcon	<i>Falco peregrinus tundrius</i>	---	Threatened	
Bald eagle	<i>Haliaeetus leucocephalus</i>	---	Threatened	
White-eared hummingbird	<i>Hylocharis leucotis borealis</i>	---	Threatened	
Brown pelican	<i>Pelecanus occidentalis carolinensis</i>	---	Endangered	
Neotropic cormorant	<i>Phalacrocorax brasilianus</i>	---	Threatened	
Mexican spotted owl	<i>Strix occidentalis lucida</i>	Threatened	---	
Bell's vireo	<i>Vireo bellii</i>	---	Threatened	X
Gray vireo	<i>Vireo vicinior</i>	---	Threatened	X
<b>Reptiles</b>				
Narrowhead garter snake	<i>Thamnophis rufipunctatus</i>	SOC	---	

**NOTE:** There are no listed endangered or threatened plants, or amphibian species in Bernalillo County for CY09.  
SOC = species of concern



### **2.1.13 Migratory Bird Treaty Act (MBTA)**

The MBTA of 1918 put the 1916 Convention for the Protection of Migratory Birds into effect. The original statute implemented the agreement between the U.S. and Great Britain (for Canada), and later amendments implemented treaties between the U.S. and Mexico, the U.S. and Japan, and the U.S. and Russia. The MBTA prevents the taking, possession, killing, transportation, or importation of migratory birds, their eggs, parts, or nests. At SNL/NM, the MBTA is coordinated through NEPA reviews and the Ecology Program.

### **2.1.14 Cultural Resources Acts**

The three primary cultural resources acts applicable at SNL/NM include:

- National Historic Preservation Act (NHPA),
- Archaeological Resources Protection Act (ARPA), and
- American Indian Religious Freedom Act (AIRFA).

At SNL/NM, cultural resources compliance is coordinated through the NEPA Program. Actions that could adversely affect cultural resources are initially analyzed in a NEPA checklist. Historical properties, as defined by NHPA and other implementing regulations, include archaeological sites and historic buildings and structures. Historic buildings and structures may include those over 50 years of age that are historically significant or younger structures of exceptional significance. There are historic buildings on property owned by DOE/NNSA. Planning assists in avoiding potential impacts to these sites, and appropriate historic documentation is undertaken to mitigate effects when necessary.

There are no known archaeological sites located on DOE/NNSA-owned property. However, archaeological sites do exist on and in close proximity to DOE/NNSA-permitted property and ER sites. These areas are located on U.S. Air Force (USAF) property and on portions of the Cibola National Forest land withdrawn area. Sandia's activities are planned to avoid potential impacts to these sites. It is DOE/NNSA's responsibility to ensure that impacts to

cultural resources are assessed and appropriate actions taken to mitigate any impact.

### ***Historical Building Assessment***

In 2009, Sandia, DOE/NNSA/SSO completed consultation with the New Mexico State Historic Preservation Office (SHPO) on actions at 15 individual buildings. Actions at 13 of the buildings were found to have no adverse effect on cultural resources. Building 884, however, was determined to be eligible for the National Register of Historic Places and documentation began to mitigate the negative impact of the building's demolition. Documentation began on Building 840, previously determined to be eligible, as it faced a significant change with the closing of the Machine Shop. Documentation continued on the environmental test facilities included in the Test Capabilities Revitalization Project, which includes one building and four districts eligible for the National Register of Historic Places, and of Building 892.

### **2.1.15 Environmental Compliance Executive Orders (EO)**

***Floodplain Management (EO 11988)***, as amended, as minimal impact for SNL/NM since all active SNL/NM facilities are located outside the 500 year floodplain as described by the U.S. Army Corps of Engineers (ACE) (USACE 1979). This applies to both major on-site drainages: Tijeras Arroyo and Arroyo del Coyote.

***Protection of Wetlands (EO 11990)***, as amended. Wetlands are areas inundated by surface or groundwater with a frequency sufficient to support a prevalence of aquatic plant and/or animal life. Wetlands generally include swamps, bogs, potholes, ponds, mud flats, and areas around natural springs. There are several natural springs on KAFB with a limited wetland setting. These springs, located on lands withdrawn from Cibola National Forest, are managed by the USAF and the U.S. Forest Service (USFS). These springs provide an important source of drinking water for wildlife and create a unique biological niche in an otherwise arid habitat.

***Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (EO 12898)***, as amended. To the greatest extent practicable and permitted by law, consistent with the principles set forth in the Report on the National

Performance Review (Gore 1993), each federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the U.S. and its territories and possessions. DOE/NNSA/SSO and Sandia perform a periodic analysis to assess whether their existing or proposed operations cause any disproportionate impacts on minority or low-income populations within the area of influence of Sandia operations.

***Strengthening Federal Environmental, Energy, and Transportation Management (EO 13423)***, was issued in January 2007. EO 13423 sets goals in the areas of energy efficiency, acquisition, renewable energy, toxin reductions, recycling, sustainable buildings, electronics stewardship, fleets, and water conservation. EO 13423 also requires more widespread use of Environmental Management Systems (EMS) as the framework in which to manage and continually improve these sustainable practices. EO 13423 incorporates the requirements of and cancels EOs 13101, 13123, 13134, 13148, and 13149, which were implemented through DOE Order 450.1 in January 2003. DOE revised Order 450.1 to include the requirements of EO 13423 in June 2008. Anticipating this change, Sandia established new EMS objectives and targets starting in Fiscal Year (FY) 2008 to support upcoming requirements.

***Leadership in Environmental, Energy, and Economic Performance (EO 13514)***, was issued in October 2009. EO 13514 establishes an integrated strategy towards sustainability to safeguard the health of our environment and make greenhouse gas emissions a priority for all federal agencies. EO 13514 sets goals in the areas of promoting electronics stewardship, pollution prevention, increased renewable energy, waste reduction, recycling, and fossil fuel usage reduction,

### **2.1.16 DOE Directives**

DOE directives on the contract baseline that pertain to environmental protection and management are discussed in Chapter 1, "Operations Contract." In 2009, Sandia met all requirements stated in these DOE directives.

### **2.1.17 Summary of Radiological Releases**

A summary of radiological releases and public doses resulting from Sandia operations is provided in Table 2-3. Additional detailed information is found in Sections 5.3 and 5.4 of this report.

## **2.2 2009 Releases, Compliance Issues, and Environmental Occurrences**

Under DOE Manual 231.1-2, an *occurrence* is defined as "one or more (i.e., recurring) events or conditions that adversely affect, or may adversely affect, DOE (including NNSA) or contractor personnel, the public, property, the environment, or the DOE mission." Events or conditions meeting criteria thresholds identified in DOE Manual 231.1-2, or determined to be recurring through performance analysis, are considered occurrences. There are environmental releases that may not meet DOE Manual 231.1-2 reporting thresholds; however, they are still reportable to outside agencies (see Chapters 2 and 6).

### **2.2.1 Occurrence Tracking**

DOE Occurrence Reporting is tracked by the Environment, Safety, and Health (ES&H) Assurance, Strategic Planning, and Behavior Based Safety (BBS) Department. All SNL/NM occurrences are entered into DOE's Occurrence Reporting Processing System (ORPS) database, which also tracks corrective actions and closure of occurrence reports.

For all categories, during 2009 there were 55 occurrences; five of these were environmentally-related at SNL/NM.

#### ***DOE Manual 231.1-2 2009 Reportable Environmental Occurrences***

Table 2-4 lists the DOE Manual 231.1-2 environmental and environmentally-related occurrences for the five year period from 2005 to 2009. The table shows all occurrences for which the "nature of occurrence" (pre-August 25, 2003) and "reporting criteria" (post-August 25, 2003) included "environmental." As stated previously, there were five reportable environmental occurrences in 2009 — One was categorized as Significance Category 2, three were categorized as Significance Category 3 and one was categorized as Significance Category 4 (the lowest level occurrence).

**TABLE 2-3. SNL/NM Radiological Dose Reporting for Calendar Year 2009**

Pathway	Dose to Off-Site MEI		Dose to On-Site MEI		Percent of DOE 100 mrem/yr Limit	Estimated Population Dose (80 km radius)		Population within 80-km radius of site	Estimated Background Radiation Population Dose	
	mrem	mSv	mrem	mSv		Person-rem	Person-Sv		Person-rem	Person-Sv
Air	4.76 E-04	4.76 E-06	1.05 E-03	1.05 E-05	0.002 percent	6.34 E-02	6.34 E-04	793,740	-	-
Water	0	0	0	0	0	0	0	0	-	-
Other Pathways	0	0	0	0	0	0	0	0	-	-
All Pathways	4.76 E-04	4.76 E-06	1.05 E-03	1.05 E-05	0.002 percent	6.34 E-02	6.34 E-04	793,740	5.03 E+04	5.03 E+02

**Radiological Atmospheric Releases for 2009 (in Curies)**

Tritium	Noble Gases (t <sub>1/2</sub> <40 days)	Fission and Activation Products (t <sub>1/2</sub> <3 hr)	Fission and Activation Products (t <sub>1/2</sub> >3 hr)	Total Radio-strontium	Total U	Other Actinides	Other
9.46 E+00	4.51 E+00	8.37 E-04	1.01 E-07	3.84 E-07	1.10 E-08	1.82 E-05	0

**Liquid Effluent Releases of Radioactive Material for 2009**

Tritium	Fission and Activation Products (t <sub>1/2</sub> <3 hr)	Fission & Activation Products (t <sub>1/2</sub> >3 hr)	Total Radio-iodine	Total Radio-strontium	Total U	Pu
0	0	0	0	0	0	0

NOTES: MEI = maximally exposed individual  
 DOE = U.S. Department of Energy  
 mrem = millirem  
 mSv = millisievert  
 km = kilometer  
 km = kilometer  
 Pu = Plutonium  
 U = Uranium

Table 2-5 summarizes each DOE Manual 231.1-2 2009 Reportable Environmental Occurrence.

## 2.2.2 Environmental Release Tracking

Environmental releases include notifications that are not tracked through ORPS, as well as notifications to outside agencies.

### 2009 Environmental Releases

In 2009, there were nine surface discharge releases that were reportable to NMED. These releases are summarized in Section 6.2.2.

## 2.3 2009 Audits and Appraisals

Operations at SNL/NM and DOE/SSO are routinely subjected to audits by external regulatory agencies. Sandia also conducts its own self-assessments and

appraisals. Environmental audits and appraisals conducted by external agencies in 2009 are listed in Table 2-6. During 2009, the ABCWUA performed inspections of the wastewater discharges. No findings or observations resulted from these inspections.

## 2.4 Summary of Reporting Requirements

External reporting requirements (other than to DOE) are necessary for both routine and non-routine releases of pollutants or hazardous substances. Release information may be used to evaluate facility operation compliance, waste handling activities, and emergency response programs. Table 2-7 summarizes the primary reporting requirements for releases applicable to SNL/NM.



**TABLE 2-4. Environmentally-Related Occurrences for Five Years (2005-2009)**

Nature of Occurrence or Reporting Criteria					
	2005	2006	2007	2008	2009
<b>Group 2 - Personnel Safety and Health</b>					
Environmental - Radionuclide Releases - 2A NOTE: This is a pre-August 2003 Nature of Occurrence.					
Personal exposure to chemical, biological, or physical hazards above limits - 2A(5) (Post-August 2003 Reporting Criteria).		4	2	2	3
Environmental - Release of Hazardous Substance/Regulated Pollutants/Oil - 2B NOTE - this is a pre-August 2003 Nature of Occurrence.					
<b>Group 5 - Environmental</b>					
Environmental releases above permitted levels and exceeds report quantities specified in 40 CFR 302 or 40 CFR 355 - 5A(1).		1			
Any discharge that exceeds 100 gallons in any form - 5A(2).	1				
Release of Hazardous Substance, Material or Waste above permitted levels and exceeds percent of report quantities specified in 40 CFR 302 or 40 CFR 355 - 5A(3).					
Release of Hazardous Substance, Material, or Waste that must be reported to outside agencies in a format other than routine periodic reports (oil spills <10 gal need not be reported) - 5A(4).	2	1	1	1	1
<b>Group 7 - (Pre-August 2003 Nature of Occurrence - does not exist in post-2003 Reporting Criteria)</b>					
Value Basis Reporting - Cost Based Occurrences - 7A.					
<b>Group 9 - Noncompliance Notifications</b>					
Any enforcement action (other than associated with the PAAA) involving ten or more cited violations, and/or an assessed fine of \$10,000 or more - 9(1).		3			
Any written notification from an outside regulatory agency that a site/facility is considered to be in noncompliance with a schedule or requirement - 9(2).	1	1	1		
<b>Group 10 - Management Concerns</b>					
Any event, condition, or series of events that does not meet any of the other reporting criteria, but is determined by the Facility Manager or line management to be of safety significance or of concern to other facilities or activities in the DOE complex - 10(2).	1	1	6	4	1
A near miss, where no barrier or only one barrier prevented an event from having a reportable consequence - 10(3).		1	3	2	
An event that results in a significance concern by affected state, tribal, or local officials, press, or general population; that could damage the credibility of the Department or that may result in inquiries to Headquarters - 10(4).	1				

**NOTES:** CFR = Code of Federal Regulations  
PAAA = Price Anderson Amendment Act  
DOE = U.S. Department of Energy

**TABLE 2-5. DOE Manual 231.1-2 Reportable Environmental Occurrences, 2009**

Month	Occurrence Significance Category	Reporting Criteria	Description
January	3	2A(5)	On January 28, 2009, a post doctoral employee working in Building 518, Room 1303, started pouring approximately 100-150 ml of aqua regia (hydrochloric and nitric acid mixture) into a container that was presumed to be empty, causing a chemical reaction and fumes, and prompting the employee to place the container inside an acid cabinet. The employee experienced eye irritation, went to medical, and was released with no restrictions. A HAZMAT team arrived, and detected chlorine vapor inside the acid cabinet. Readings taken with the instruments indicated levels well above the ACGIH limits for personnel exposure, therefore it was assumed that the post doc exceeded the ACGIH limit for chlorine. The lid to the waste container was closed by the HAZMAT team members, who declared the lab safe to enter with subsequent instrument readings. Subsequent examination of the container revealed a label stating that the container held sulfuric acid. The reaction of sulfuric and hydrochloric acids produced the chlorine gas.
February	2	10(2)	On February 11, 2009, laboratory personnel detected an offensive odor inside the Advanced Material Laboratory (AML). The odor was associated with a standard operation - regenerating the catalyst stack on a chemical glove box located in Room 104. Initial assessment points to fumes, which are exhausted off the catalyst stack during this process, were not completely exhausted through the ventilation system and caused a very noticeable odor in the lab/AML wing. Laboratory personnel quickly ascertained the problem and shut down the regeneration cycle. One SNL/NM contractor received a headache from the fumes, and a SNL/NM technologist had to leave the area to stop from coughing. SNL/NM personnel were also notified on February 12, 2009, that a couple of members of PhDx Systems reported feeling dizzy from the fumes. A critique was performed.
March	3	2A(5)	On March 10, 2009, a mechanic was working on a diesel back-up generator in Building 858N, while wearing protective ear muffs to protect his hearing. IH personnel were monitoring this activity. Later, when IH personnel calculated the results of the monitoring, it was found that the OSHA maximum decibel level of 84.5 dB had been exceeded. The level of exposure was 86 dB. All personnel were notified to wear two forms of hearing protection when working on generators.
April	4	5A(4)	On April 21, 2009, it was determined that a suspected hydraulic oil release from an in-ground vehicle lift may have contaminated ground soil due to a potential leak in the piping or lift housing (probably due to age and electrolysis). Although the hydraulic oil is deemed not to be a hazardous material according to the MSDS, the release to the soil was reported to NMED as it did meet other environmental non-occurrence reporting criteria. It is estimated that 22 gallons of oil leaked from the vehicle lift. The contaminated soil was removed and handled as New Mexico Special Waste. Confirmatory sampling was done to confirm adequate removal of petroleum contamination and laboratory results will be transmitted to NMED for final closure.

See notes at end of table.

**TABLE 2-5.** DOE Manual 231.1-2 Reportable Environmental Occurrences, 2009 (concluded)

Month	Occurrence Significance Category	Reporting Criteria	Description
July	3	2A(5)	Between June 29, 2009 through July 1, 2009 while performing oversight compliance monitoring (personal breathing zone) of four subcontractor workers who were performing sheetrock taping, mudding, and sanding during remodeling in Buildings 755 and 857, the SNL/NM IH identified that two of the workers were exposed to respirable silica dust that exceeded the ACGIH Threshold Limit Value (TLV) of 0.025 mg/m <sup>3</sup> . The subcontractor employees were not wearing respiratory protection. One worker's exposure in Building 857 was 0.0538 mg/m <sup>3</sup> and the other worker's exposure in Building 755 was 0.0439 mg/m <sup>3</sup> . A critique/fact finding was performed.

**NOTES:** % = percent  
 TA = Technical Area (I through IV)  
 in = inch  
 ml = milliliter  
 DOE = U.S. Department of Energy  
 NMED = New Mexico Environment Department  
 mg/m<sup>3</sup> = milligram per cubic meter  
 OSHA = Occupational Safety and Health Administration

sq ft = square feet  
 ft = feet/foot  
 TLV = threshold limit value  
 POTW = Publicly-Owned Treatment Works  
 SNL/NM = Sandia National Laboratories, New Mexico  
 TTR = Tonopah Test Range  
 ACGIH = American Conference of Governmental Industrial Hygienists

## 2.5 Summary of Environmental Permits

Table 9-1 in Chapter 9 lists all environmental permits and registrations that were in effect in 2009. It includes pending permit applications under review by various agencies.

## 2.6 Environmental Performance Measures

Environmental performance at SNL/NM is tracked through performance measures and indicators. It is reported through management reports and annual summaries (such as this report).

Table 2-8 lists the environmental performance measure results for Notices of Violations at SNL/NM.

Environmental performance is also assessed through performance measures in the Performance Evaluation Plan (PEP) agreement between DOE/NNSA/SSO and Sandia. On the basis of the PEP, DOE/NNSA/SSO prepares an annual Performance Evaluation Report (PER) that assesses Sandia's performance for the FY. For FY 2009, the overall score for Sandia was listed as "Outstanding."

**TABLE 2-6. Environmental Program Audits and Appraisals Conducted In 2009**

Appraising Agency	Title	Date	Summary
<b>External Audits and Appraisals</b>			
ABCWUA	ABCWUA inspected facilities within Flow Basins 2069A, 2069F, 2069G, 2069I, 2069K and 2238A	Inspected during February, April, June, August and October of 2009	No findings or observations resulted from these inspections
BSI	ISO 14001 Assessment	May 11, 2009	13 Minor Findings (non-conformities)
BSI	ISO 14001 Assessment	November 10, 2009	4 Minor Findings (non-conformities)
<b>Internal Audits and Appraisals</b>			
LESA 4743	NESHAP Compliance	April 23, 2009	2 Observations 3 Noteworthy Practices
LESA 4744	Water Quality – Wastewater	May 22, 2009	1 Observation 3 Noteworthy Practices
LESA 4745	NEPA Compliance – Line Support and EA&EIS	June 4, 2009	1 Noteworthy Practice 1 Acceptable Practice
LESA 7434	Environmental - DOE Order 450.1A Requirements Assessment	June 8, 2009	1 Observation
LESA 4746	Air Permits Bernalillo County	June 16, 2009	1 Observation
LESA 4749	Water Quality – Storm Water	June 22, 2009	1 Significant Finding (tracked in CATS – CAR ID AT0003630) 1 Minor Finding 1 Noteworthy Practice
LESA 4751	Ozone Depleting Substances	September 18, 2009	1 Observation
LESA 7842	General Training	October 1, 2009	1 Observation
LESA 7845	Environmental Planning	October 21, 2009	1 Observation
LESA 7843	TEDS Training	October 24, 2009	1 Minor Finding
LESA 7841	Objective/Targets Monitoring	October 29, 2009	1 Observation
LESA 7844	Management Review	November 6, 2009	1 Minor Finding
LESA 7846	Evaluation of Compliance of Environmental Programs	November 9, 2009	1 Observation

**NOTES:** ABCWUA = Albuquerque Bernalillo County Water Utility Authority  
 LESA = Laboratory Enterprise Self Assessment  
 BSI = British Standards Institute  
 ISO = International Organization for Standardization  
 EPA = U.S. Environmental Protection Agency  
 UST = Underground Storage Tank  
 TEDS = Training and Employee Development System  
 CATS = Corrective Action Tracking System  
 NESHAP = National Emissions Standards for Hazardous Air Pollutants  
 NEPA = National Environmental Policy Act  
 EA = Environmental Assessment  
 EIS = Environmental Impact Statement  
 DOE = U.S. Department of Energy

**TABLE 2-7. Summary of Sandia Reporting Requirements to Outside Agencies (Other than DOE)  
for Releases of Pollutants or Hazardous Substances**

Report Title	Description	Agency
Annual NESHAP Dose Assessment Report	A dose assessment of the calculated EDE to the MEI is based on the assumption that an exposed individual resides 24 hours-per-day at an area of highest incident radiation. Dose assessment is discussed in Section 5.4 of this report.	EPA 40 CFR 61, Subpart H
RQ Accidental Release Reporting	RQ release reporting is required by CERCLA and SARA Title III, or EPCRA to the NRC. CERCLA and EPCRA are discussed in Section 2.1.1 and 2.1.2 of this report. There were no reportable releases in 2009.	NRC 40 CFR 302
TRI Report	EPCRA, Sections 302, 311, 312, and 313, requires a TRI report to be filed by facilities conducting specifically listed industrial activities and using listed toxic chemicals. As discussed in Section 2.1.2, Sandia is currently required to submit a TRI report because its chemical use is above the reporting threshold.	EPA 40 CFR 372, Subpart B
Notification of Discharge	NMED requires reporting of oil or other water contaminant, in such quantity as may with reasonable probability injure or be detrimental to human health, animal or plant life, or property, or unreasonably interfere with the public welfare or use of the property shall make oral notification as soon as possible after learning of such a discharge, but in no event more than 24 hours thereafter to the NMED. Within one week, the owner and/or operator shall send written notification to the appropriate Bureau Chief verifying the prior oral notification. Within 15 days, the owner and/or operator shall send written notification to the appropriate Bureau Chief describing any corrective actions taken and/or to be taken relative to the discharge. Nine surface discharge releases occurred in 2009. Details of these events are summarized in Section 6.2.2.	NMED 20.6.2.1203 NMAC
Accidental Slug Discharge Notification	The ABCWUA requires immediate notification to the Wastewater Utility Division of any accidental/slug discharge that may cause potential problems for the POTW. Within five days following such occurrence, the user is required to provide the Industrial Waste Engineer with a detailed written report describing the cause of the dangerous discharge and measures to be taken to prevent similar future occurrences. During CY 2009 there were no reportable events to the ABCWUA.	Bernalillo County Water Utility Authority Sewer Use and Wastewater Control Ordinance

**NOTES:**

CY = Calendar Year	EDE = Effective Dose Equivalent
MEI = Maximally Exposed Individual	EPA = U.S. Environmental Protection Agency
CFR = Code of Federal Regulations	RQ = Reportable Quantity
NRC = U.S. National Response Center	NMAC = New Mexico Administrative Code
Sandia = Sandia Corporation	CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
SARA = Superfund Amendments and Reauthorization Act	NMED = New Mexico Environment Department
TRI = Toxic Release Inventory	POTW = Publicly-Owned Treatment Works
COA = City of Albuquerque	EPCRA = Emergency Planning and Community Right-to- Know Act
ABCWUA = Albuquerque Bernalillo County Water Utility Authority	
NESHAP = National Emission Standards for Hazardous Air Pollutants	



**TABLE 2-8.** Environmental Performance Measures for SNL/NM only

Measure	2006 Goal	2006 Actual	2007 Goal	2007 Actual	2008 Goal	2008 Actual	2009 Goal	2009 Actual	2010 Goal
Number of Notices of Violation (NOV)	0	3	0	1	0	0	0	0	0
Amount of fines or penalties	\$0	\$20,000 Air Quality NOV; \$40,820 Waste NOV	\$0	\$4,504 for 2005 NMED RCRA	\$0	\$0	\$0	\$0	\$0

**NOTES:** % = percent  
 < = less than  
 mt = metric tons

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# 3.0 Environmental Programs Information

Environmental programs carried out by Sandia Corporation (Sandia) are in place to protect the environment, safety, and health (ES&H) of its employees and the community. These environmental programs meet or exceed the requirements of federal, state, and local environmental regulations, as well as U.S. Department of Energy (DOE) directives in the Prime Contract between Sandia and DOE. Presidential Executive Orders (EO) and DOE guidance documents are also used to establish program criteria.

The environmental programs are part of Sandia's Environmental Management System (EMS). Sandia's EMS is its primary management approach for addressing environmental aspects of operations and activities, including energy and transportation functions.

## ***Environmental Monitoring History***

Environmental monitoring began at Sandia National Laboratories, New Mexico (SNL/NM) in 1959 when the principal objective was to monitor radioactive effluents and determine any associated environmental impacts. Since then, environmental programs, along with other ES&H activities, have greatly expanded at SNL/NM.

## ***ES&H Policy***

Sandia's ES&H policy is implemented to protect and preserve the environment and to ensure the safety and health of its employees, contractors, visitors, and the public while maintaining the corporate vision and mission. Sandia's corporate ES&H Program mandates compliance with all applicable laws, regulations, and DOE directives included in the Prime Contract between DOE and Sandia, internal Corporate Processes, and permit requirements. As such, Sandia has committed to the following:

- Plan work incorporating safety awareness, protective health practices, environmental management, pollution prevention (P2), and the long-term environmental stewardship (LTES) of resources;

- Identify hazards and evaluate, monitor, and manage risks with effective ES&H systems;
- Implement controls that prevent injury, exposure to hazardous materials, and the release of materials that could be hazardous to the environment;
- Perform quality work while protecting people, the environment, and our nation's security;
- Continually improve ES&H performance by establishing, meeting, and assessing measurable ES&H goals, objectives, targets, and milestones; and
- Regularly communicate ES&H issues to the Members of the Workforce, the community, regulators, and our stakeholders.

## ***Integrated Safety Management System (ISMS)***

Sandia's methodology for managing and implementing its ES&H Program is outlined in the ISMS. The ISMS is centered on five safety management functions, which provide processes to guide management in identifying and controlling hazards. These include:

- (1) plan work,
- (2) analyze hazards,
- (3) control hazards,
- (4) perform work, and
- (5) seek feedback and improvement.

## **3.1 Sandia EMS**

In accordance with DOE Order 450.1A, *Environmental Protection Program*, Sandia implemented an EMS as part of the ISMS. The EMS is the framework by which SNL/NM manages, and continually improves, its environmental compliance and sustainability practices. The EMS identifies the environmental consequences of SNL/NM's activities, products, and services and develops objectives and measurable targets to mitigate potential impacts to the environment.

SNL/NM implemented its EMS in December 2005 and received third-party International Organization for Standardization (ISO) 14001 Certification in 2009. Since that time, Sandia has worked to fully implement and establish the EMS in conjunction with ISMS in all site operations. Some major accomplishments of the EMS for Fiscal Year (FY) 2009 include:

- Corporate-and division-level EMS objectives and targets were established and tracked quarterly to survey progress;
- Internal and external outreach events were conducted to increase environmental awareness;
- Environmental program plans that detail requirements, roles and responsibilities, schedules, deliverables, and budgets were updated;
- EMS benchmarking exercises were conducted to determine how DOE and other facilities designed and implemented their EMS;
- Chemical Exchange Program (CEP) was implemented, reapplying over 339 chemicals, reducing 1,461 kilograms (kg) of hazardous waste and avoiding approximately \$98,735 and \$22,985 in waste and new purchase costs, respectively;
- Based on the Calendar Year (CY) 2008 High Performance Sustainable Buildings Guiding Principles Assessments, Building 750 was selected for green building certification. Building modifications, occupant education, retro-commissioning and other “greening” activities occurred toward the achievement of Leadership in Energy and Environmental Design for Existing Buildings Operations and Maintenance (LEED EBOM) certification during CY 2009. The award of LEED EBOM certification is expected in early CY 2010; and
- Additionally, in CY 2009, 16 more buildings were prioritized to be assessed for compliance with the High Performance Sustainable Buildings Guiding Principles.

The EMS is a continuous improvement system that includes all environmental programs in an integrated approach to effectively minimize the impact of SNL/NM’s operations on the environment. Each year, Sandia’s work processes are reviewed, and new

environmental objectives and measurable targets are set to ensure continual improvement in our environmental performance. Additional information can be found on the external EMS website:

<http://environment.sandia.gov/new/index.shtml>

### **3.2 Environmental Restoration (ER) Project**

Sandia’s ER Project was created under the DOE Office of Environmental Management (EM) to identify, assess, and remediate sites potentially contaminated by past spill, release, or disposal activities in accordance with the Resource Conservation and Recovery Act (RCRA), as amended by the Hazardous and Solid Waste Amendments (HSWA) of 1984. HSWA requirements apply to ER sites which include Solid Waste Management Units (SWMU) or areas of concern (AOC). A SWMU is any unit “from which hazardous constituents might migrate, irrespective of whether the units were intended for the management of solid and/or hazardous waste” (EPA 1985).

There are additional AOC at SNL/NM that are not regulated as SWMUs (primarily closed-out septic systems) that have also been investigated as a part of the ER Project. These AOC were not identified at the time of the issuance of Module IV of the RCRA Part B Operating Permit; however, they were identified by the New Mexico Environment Department (NMED) as requiring investigation. Consequently, they were investigated and addressed as if they had been SWMUs listed on the permit.

The Chemical Waste Landfill (CWL) was closed under interim status as discussed in Section 2.1.3. Closure activities, including two voluntary corrective measures (VCM), were conducted under Sandia’s ER Project. One of the VCMs involved excavation of the entire landfill; the soil was treated as needed and placed in an on-site Corrective Action Management Unit (CAMU) containment cell constructed for long-term management.

Sandia, DOE, and NMED negotiated a Compliance Order on Consent (COOC) that was signed in April 2004. The COOC governs corrective action for releases of hazardous waste or hazardous constituents at SNL/NM. The COOC will terminate upon the completion of its requirements, with the exception of

record preservation, and the Hazardous Waste Facility Permit will remain as the enforceable document.

### **3.2.1 Cleanup and Site Closures**

Waste generated from SNL/NM ER sites include hazardous waste, radioactive low-level waste (LLW), mixed hazardous/radioactive waste (MW), Toxic Substances Control Act (TSCA) waste (primarily polychlorinated biphenyls [PCB]), and industrial solid waste. This chapter discusses the waste volumes generated by the ER Project in Section 3.4.

#### ***ER Project History***

The initial identification of ER sites at SNL/NM was completed in 1987. At that time, there were 117 identified sites under Sandia's jurisdiction in the initial *Comprehensive Environmental Assessment and Response Program (CEARP) Phase I: Installation Assessment* (DOE 1987).

Since then, a total of 500 individual sites, potential sites, or individual historical activities have been identified for investigation. Many of these sites were confirmed to contain little or no contamination of concern. In 1992, the ER Project at SNL/NM was officially initiated to implement assessment and remediation activities for sites that had been contaminated or potentially contaminated because of past Sandia operations. In addition to the SNL/NM site, other sites included in the original scope of Sandia's ER Project were Sandia National Laboratories, Livermore, California (SNL/CA), the Kauai Test Facility (KTF), and the Tonopah Test Range (TTR). There were also a number of miscellaneous sites located in other areas, nationwide and internationally.

#### ***Corrective Action Complete (CAC) Status***

DOE and Sandia propose ER sites to NMED for CAC status when they meet NMED criteria, either before or after remediation; the criteria include acceptable levels of risk to human health and the environment presented by the contaminants at the site.

After NMED grants CAC status, DOE and Sandia submit a request for a Class III modification to the HSWA Module (Module IV) of Permit NM5890110518-1 (the Permit) requesting that the site be deleted from Table A.1 "*List of Solid Waste Management Units (SWMU) and Areas of Concern (AOC) Requiring Corrective Action*" of the permit and added to Table A.2 "*List of Solid Waste Management*

*Units (SWMUs) and Areas of Concern (AOCs) not currently requiring Corrective Action*" of the permit.

The majority of ER sites are granted CAC status under a risk-based scenario. Risks to human health and the environment are calculated for sites with residual contamination according to U.S. Environmental Protection Agency (EPA) and NMED guidelines. The level of contamination remaining, and the appropriate land-use category (i.e., industrial, residential, or recreational use) are used, together with the available information and conceptual model for each site, to determine the risk to human health and the environment.

At the close of 2009 there were 33 ER sites remaining on the list of sites requiring corrective action (excluding three soil sites with active test operations) (Table 3-1). DOE and Sandia have submitted requests for Class III Permit modifications to address 31 of the remaining sites. All CAC proposals and Class III Permit modifications are available for review at the University of New Mexico (UNM) Zimmerman Library.

### **3.2.2 Selected Units at SNL/NM**

#### ***CWL***

The CWL, an interim status landfill, is approximately 1.9 acres and is located in the southeast corner of Technical Area (TA)-III. From 1962 through 1985, the CWL was used for disposal of hazardous wastes, chemicals, and solid wastes generated by SNL/NM research activities. The CWL was also used as a hazardous waste drum storage facility from 1981 to 1989.

The permitting and closure processes for the CWL were initiated during the 1980s. NMED approved the closure plan in 1993. Closure activities were conducted through the ER Project and included two VCMs: soil vapor extraction (SVE) and landfill excavation (LE). Excavation of the landfill began September 30, 1998. Over 52,000 cubic yards (yd<sup>3</sup>) of soil and debris were excavated from the landfill between 1998 and 2002. Except for the area around one verification sampling grid point that was excavated in January 2003, all excavation was completed in February 2002. The excavation process, waste management activities, final verification soil sampling analytical results, and final risk assessment were presented in the LE VCM Final Report (SNL 2003), which was approved by NMED on December 16, 2003 (Moats 2003). The primary



**TABLE 3-1.** Summary of ER Project Status, 1992 - 2009

	A	B	C	D	E	F <sup>2</sup>
Year	Total ER Sites Remaining at Start of FY	ER Sites Proposed for CAC	Sites Approved for CAC	Corrective Actions Completed by End of Year	New ER Sites Identified During Year	Total ER Sites Remaining at End of FY
2009	33	0	0	0	0	33
2008	61	0	28	0	0	33
2007	61	1	0	0	0	61
2006	110	6	49	3	0	61
2005	126	21	18	51	+2 <sup>3</sup>	110
2004	125	41	0	1	+1 <sup>4</sup>	126
2003	126	15	0	5	-1	125
2002	158	3	30	2	-2	126
2001	87	7	0	4	71	158
2000	146	10	64	10	5	87
1999	146	4	0	20	0	146
1998	146	16	0	0	0	146
1997	153	30	7	4	0	146
1996	155	35	2	29	0	153
1995	191	61	36	34	0	155
1994	219 <sup>5</sup>	48	28	3	0	191
1993	219 <sup>5</sup>	0	0	0	0	219
1992	172	0	0	0	47	219

**NOTES:** ER = Environmental Restoration  
FY = Fiscal Year  
CAC = Corrective Action Complete  
Column A = Total ER Sites remaining to be removed from the Resource Conservation and Recovery Act (RCRA) Permit  
Column B = ER Sites submitted for CAC including reinvestigations per New Mexico Environment Department (NMED)  
Column C = ER Sites receiving final regulatory approval (Class III Permit Mod) by NMED  
Column D = fieldwork completed including reinvestigations  
Column E = newly identified sites or sites reopened by NMED  
Column F = Total Sites remaining on the RCRA Permit at the end of the FY  
<sup>1</sup> Includes all final submittals of CAC documentation including RSEs and Notice of Disapproval (NODs)  
<sup>2</sup> Column totals: F = A - C + E  
<sup>3</sup> Two Drain and Septic Systems (DSS) sites determined inactive in FY05 were submitted for CAC  
<sup>4</sup> One DSS Area of Concern (AOC) was determined to be inactive in FY04 and submitted for CAC  
<sup>5</sup> Some of the original 219 sites included Tonopah Test Range (TTR), Kauai Test Facility (KTF), and other off-site areas

contaminants of concern (COC) at the CWL are volatile organic compounds (VOC) and metals.

The majority of the soils excavated from the CWL were managed at the CAMU, which is located adjacent to the CWL. The soils were treated as needed and placed into the CAMU containment cell for long-term management. Sampling and final cleanup of the CWL site was completed in February 2004 and documented in an addendum to the LE VCM Final Report approved by NMED in October 2005.

As part of the CWL closure process defined in the amended Closure Plan, DOE and Sandia submitted a compilation of documents to NMED on May 20, 2003 that included the CWL Corrective Measures Study (CMS) Report, Remedial Action Plan (RAP), and Post-Closure Care Plan (PCCP), with a request that NMED select the remedy through approval of the CMS Report and RAP, and approve the PCCP for post-closure care. A revised CMS Report was submitted in December 2004, as requested by NMED; the revised RAP was included as an annex. A revised PCCP was submitted to NMED as a permit application in September 2005. In May 2004, DOE

and Sandia requested NMED approval of an Interim Corrective Measure (ICM) to allow construction of the at-grade evapo-transpirative landfill cover; the design for this cover was originally presented in the May 2003 RAP. NMED approved the ICM in September 2004. Backfilling of CWL to four feet (ft) below ground surface (bgs) was completed in February 2004. The CWL cover installation began in March 2005 and was completed in September 2005.

On May 21, 2007, NMED issued a draft CWL Post-Closure Care Permit for public comment, together with a notice of intent to approve the CMS Report and the final remedy selected for the CWL (i.e., at-grade evapo-transpirative cover) and a Closure Plan amendment. DOE and Sandia submitted comments on the draft permit to NMED and requested a public hearing. Several citizens also submitted comments and requested a public hearing. Informal negotiations were initiated by the NMED in August 2008 with all interested parties requesting a public hearing. These negotiations continued into CY 2009, and in October 2009 the CWL Closure Plan Amendment, as changed, the CWL Post-Closure Care Permit, and the CWL CMS Report/Final Remedy were approved by NMED. After installation of four new monitoring wells and NMED approval of the Final CWL RCRA Closure Report, monitoring and post-closure care at the CWL will be performed under the CWL Post-Closure Care Permit.

### **CAMU**

The CAMU (located in TA-III near the CWL) is permitted under RCRA and TSCA for the management of remediation waste (primarily contaminated soil) generated during the LE VCM at the CWL. Storage, treatment, and containment activities are authorized under the CAMU permit (EPA 1997). Two treatment processes, Low Temperature Thermal Desorption (LTTD) for organic compounds and stabilization treatment (ST) for metals, were used as needed to treat soil wastes before they were placed in the containment cell. LTTD treatment operations were completed in December 2002, and ST treatment activities were completed in January 2003.

The staging, treatment, and support areas at the CAMU were clean-closed under the RCRA and TSCA provisions outlined in the closure plan (SNL 2002). The CAMU containment cell cover was installed in July 2003, which encapsulated the CWL remediation waste in place. The CAMU was certified closed on

October 15, 2003 in compliance with the closure requirements documented in the RCRA Closure Report (SNL 2003a). The CAMU containment cell, where the treated waste remains, will continue to be monitored and maintained in accordance with post-closure requirements.

The CAMU containment cell consists of engineered barriers, a final cover system, and incorporates a bottom liner system with a leachate collection system and a vadose zone monitoring system (VZMS). The VZMS provides information on soil conditions under the cell for early detection of leaks. The VZMS consists of three subsystems that include the primary subliner (PSL), a vertical sensor array (VSA), and the CWL and sanitary sewer line (SSL) monitoring subsystems. The PSL, VSA, and CWL SSL monitoring subsystems are monitored quarterly for the composition of soil vapors and soil moisture content.

In 2009, 587 gallons (gal) of leachate were removed from the collection system; 761 gal of leachate were removed during 2008. The leachate is pumped from the containment cell leachate collection system on a weekly basis. The leachate is a listed hazardous waste (F039 - Leachate [liquids that have percolated through land disposed wastes] resulting from the disposal of more than one restricted waste classified as hazardous under Subpart D of this part). The pumped leachate is containerized in 55-gal poly drums and stored in a RCRA 90-Day Storage Area. The waste is characterized by drawing a composite sample which is sent to an off-site laboratory for analysis. The waste is transported to the SNL/NM Hazardous Waste Management Facility (HWMF). The waste is subsequently shipped to an off-site hazardous waste facility for treatment.

Baseline data for soil moisture and soil vapor were established between October 2003 and September 2004. Baseline is defined as data collected monthly for one year after the closure of the containment cell in October 2003. The soil moisture monitoring results for 2009 indicate increases at two of the CWL SSL monitoring subsystem locations when compared to the baseline data. Increasing soil moisture at location CSS-2 (12- and 16-ft depths) was first observed in September 2005, and the increasing soil moisture trend at location CSS-3 (12-ft depth) was first observed in March 2007. The monitoring results for 2010 indicate the soil moisture at CSS-2 (12- and 16-ft depths) has stabilized but continues to increase at the CSS-3 (12-depth). However, the PSL and

VSA monitoring subsystem location soil moisture data have remained consistent with the baseline data indicating that the containment cell is not the source of the moisture.

The 2009 soil vapor monitoring results demonstrated a continued upward trend (with minor seasonal fluctuations) in VOC concentrations at the CWL SSL and VSA monitoring subsystem locations, which is consistent with the baseline data trends. The increasing VOC concentrations are attributed to the remnant soil vapor plume around the CWL, and consistent with the conceptual model of the CWL residual soil vapor plume (SNL 2004). The increasing trends are not attributed to the material in the CAMU containment cell. VZMS monitoring results are compiled and reported on an annual basis; the most recent report was submitted in September 2008 (SNL 2008). The annual VZMS monitoring reports are submitted to NMED as required by the CAMU permit (EPA also receives a copy).

#### ***Groundwater Management Units***

In 2009, SNL/NM ER personnel performed groundwater monitoring at CWL, MWL, Burnsight Groundwater (BSG), Tijeras Arroyo Groundwater (TAG), and TA-V. SNL/NM personnel will continue groundwater monitoring as a part of Corrective Measures Implementation (CMI) and LTES. The Corrective Measures Evaluation (CME) report for TA-V was submitted to NMED in July 2005 and Notices of Disapproval were received from NMED in August 2009 and December 2009. The CME report for TAG was submitted in September 2005, but no comments have been received from NMED. After regulatory selection and public review of the preferred remedy, CMI Plans can be prepared for TAG and TA-V. Revised monitoring under the CMI plan for TAG and TA-V cannot begin until NMED reviews and approves the CME reports and CMI plans.

#### ***MWL***

The MWL was established in 1959 as a disposal area for radioactive waste and mixed waste (MW) generated at SNL/NM research facilities. The landfill accepted approximately 100,000 cubic feet (ft<sup>3</sup>) of LLW and minor amounts of MW from March 1959 through December 1988. Tritium is the contaminant of primary concern at the MWL. It has been detected in surface and subsurface soils in and around the classified area of the landfill. However, there is no indication

that tritium or other contaminants have migrated to groundwater, which is approximately 500 ft bgs at the MWL. Tritium is released from MWL soils to the atmosphere at low levels, which do not pose a threat to human health or the environment.

The monitoring network at the MWL consists of seven wells. In 2009, MWL groundwater samples were analyzed for VOCs, semi-volatile organic compounds (SVOC), target analyte list (TAL) metals and total uranium, NPN (reported as nitrogen), anions, tritium, gross alpha/beta radioactivity, gamma-emitting radionuclides, manganese II, total organic carbon (TOC), carbon dioxide, total dissolved solids (TDS), ferrous iron, and biological oxygen demand (BOD). The COOC (NMED 2004) requires that new wells be sampled for perchlorate for a minimum of four quarters. In CY 2009, the groundwater monitoring wells installed in 2008 (MWL-MW7, MWL-MW8, MWL-MW9, and MWL-BW2), were still part of the perchlorate screening monitoring well network. Sampling results from MWL wells are compared with maximum contaminant levels (MCL), where established. Additional information on the analytical results for MWL well network can be found in Section 7.2.2.

On October 11, 2001, NMED directed Sandia and DOE, National Nuclear Security Administration, (NNSA), Sandia Site Office (SSO) to conduct a CMS for the MWL. The MWL CMS Report was submitted to NMED on May 21, 2003. In the CMS, DOE and Sandia identified, developed, and evaluated corrective measures alternatives and recommended the corrective measures to be taken at the MWL. Based upon detailed evaluation and risk assessment, using guidance provided by EPA and NMED, DOE and Sandia recommended that a vegetative soil cover be deployed as the preferred corrective measure for the MWL.

NMED selected a vegetative soil cover with a bio-intrusion barrier as the remedy and issued a draft Class III modification to the Permit to incorporate corrective measure for the MWL. Following a public comment period, NMED conducted public hearings on December 2-3 and 8-9, 2004. On May 26, 2005, the Secretary of NMED selected a vegetative soil cover with a bio-intrusion barrier as the remedy for the MWL, based on the information in the administrative record and the hearing officer's report. The Secretary of

NMED requested that a CMI Plan incorporating the final remedy be developed within 180 days following the selection of the remedy. The MWL is subject to a Final Order for Corrective Measures (FOCM) for the MWL issued by the Secretary of NMED.

On November 9, 2005, DOE/NNSA/SSO and Sandia submitted a CMI Plan to NMED documenting the plans for construction of a cover for the MWL. The document contains a description of the selected remedy, the objectives for the remedy, detailed engineering design drawings and construction specifications, a construction quality assurance (QA) plan, and a health and safety plan. The cover design consists of a vegetated 3-ft thick soil cover overlying a 1-ft thick rock bio-intrusion barrier. The design will rely upon soil thickness and evapo-transpiration to provide long-term performance and stability.

The CMI Plan also included the results of a comprehensive fate and transport model that was used to assess the performance of the MWL and monitoring triggers for future action. The triggers identify and detail specific monitoring results that would initiate an evaluation process to determine whether corrective action was necessary.

In June 2006, the DOE/NNSA/SSO and Sandia began clearing and grubbing the subgrade at the MWL in preparation for eventual cover construction activities. NMED submitted a Notice of Disapproval (NOD) for the MWL CMI Plan in November 2006, requesting additional information regarding landfill construction plans and performance modeling. The MWL NOD also requested additional and more restrictive triggers for corrective action in the event that the proposed remedy designs fail to protect human health and the environment. DOE/NNSA/SSO and Sandia responses to the MWL NOD were submitted to NMED in December 2006 and January 2007. The third NOD was sent to NMED in December 2008. NMED granted approval of the CMI Plan the same month, which initiated the process of implementing the final remedy by installing the landfill cover. Construction was completed in 2009, and the CMI Report is scheduled to be delivered to NMED in January 2010.

In September 2007, DOE/NNSA/SSO and Sandia submitted to the NMED a Long-Term Monitoring and Maintenance Plan (LTMMP) to address monitoring, maintenance, and physical and institutional controls (IC) for the MWL. The LTMMP is currently under review and NMED has solicited public comment.

### **3.3 Long Term Environmental Stewardship (LTES) Activities**

The SNL/NM LTES involves stewardship for past, present, and future activities at SNL/NM. The LTES program's purpose is to "promote the long-term stewardship of a site's natural and cultural resources throughout its operational, closure, and post-closure life cycle" (DOE/SNL 2006). The environmental programs mentioned in this document support that stewardship.

Long Term Stewardship (LTS) of legacy sites is one component of the LTES program. Stewardship of legacy sites is defined as "activities necessary to maintain long-term protection of human health, the environment, and natural and cultural resources from hazards associated with residual radioactive and hazardous contamination at former ER sites." Sandia's LTS activities are increasing as remedial activities at ER sites are completed. The LTS Program conducts compliance oversight activities, including long-term monitoring to meet NMED requirements, conducts institutional control activities, and outreach activities to keep the public apprised of the LTS Program.

#### ***Compliance Oversight Activities***

More than 66 groundwater monitoring wells associated with former ER sites are monitored to meet NMED requirements. Water level measurements were obtained from 76 wells. Water quality data and water levels are reported in detail in SNL/NM's Annual Groundwater Monitoring Report and Chapter 7. Monitoring wells are maintained or replaced as necessary. The LTS Program also conducts the long-term monitoring of the CAMU. Leachate is pumped weekly, and periodically sampled and disposed. This program produces the CAMU Vadose Zone Monitoring System Annual Monitoring Results Report, which contains more details on activities conducted, and sampling results. A comprehensive information management system is used to manage data from past sampling



activities and currently generated monitoring data. This system ensures that legally defensible monitoring data are created to ensure protection of human health and the environment.

#### ***IC Activities***

Former ER sites that have not been cleaned up to residential risk standards are periodically inspected and maintained when necessary. An IC tracking system has been created to help manage site IC information. A total of 25 IC site inspections were completed in 2009.

#### ***Community Liaison and Stakeholder Involvement Activities***

It is important that the public be made aware of the work being conducted to maintain long-term protection of human health, the environment, and natural and cultural resources from hazards associated with residual radioactive and hazardous contamination at former ER sites. Semi-annual newsletters and an Annual Site Environmental Report (ASER) summary pamphlet are published and distributed to the public. In addition, an LTES website was created for public access. It contains key environmental regulatory decision documents for all former ER sites and a map with site locations. The LTES website is updated as new regulatory documents are submitted by DOE/ NNSA/SSO and Sandia to the NMED. Stakeholders participate in semi-annual DOE, Department of Defense (DoD) meetings on environmental activities. The LTES/LTS Program has updated the Community Checklist, which was compiled by Sandia's Members of the Workforce and community members who have an interest in LTES/LTS at SNL/NM. The Community Checklist contains the community members' questions about LTES/LTS and is posted to the LTES website. The Community Checklist is updated annually with new concerns or questions from the community. Please visit the LTES website for more information:

<http://ltes.sandia.gov>

Click on "Legacy" for information about LTS sites.

### **3.4 Waste Management**

Waste at SNL/NM is managed at ten facilities: the HWMF, the Thermal Treatment Facility (TTF), the RMWMF, five Manzano Storage Bunkers (MSB), the Auxiliary Hot Cell Facility (AHCf), and the Solid

Waste Transfer Facility (SWTF). The primary waste types handled by these waste management facilities are shown below.

#### **3.4.1 Hazardous and Chemical Waste**

The HWMF packages, segregates, stores, and ships hazardous and chemical wastes. A lined catchment pond within the HWMF perimeter is used to contain all storm water runoff; if there is a spill or release, this is monitored before discharging. Hazardous waste is tracked from the point of generation to final disposal through meticulous "cradle to grave" documentation at each waste handling step. Each waste item received at the HWMF is labeled with a unique bar code, linking the item to the original disposal request. An individually coded waste item typically is a bottle, plastic bag, or other small item that contains chemicals or other waste.

All waste is reviewed at the HWMF before being placed in temporary storage. After sufficient quantities of items have accumulated in the storage bays, the items are packed into larger containers, which are also bar-coded. These packages are moved to an adjacent building to await shipment to a permitted treatment, storage or disposal (TSD) facility or recycling center. Waste is usually processed and shipped off-site within 90 days of receipt.

Applicable regulations for hazardous and chemical waste handled by the HWMF are listed in Chapter 9.

#### ***2009 Activities at the HWMF***

In CY 2009, a total of 12,715 package items (481,913 kg or 1,060,210 pounds [lb]) were handled by the HWMF. Of these, 8,491 packages (395,370 kg or 869,814 lb) were shipped off-site; wastes in 1,399 packages were recycled.

Specific waste categories handled and shipped in 2009 are shown in Table 3-2.

#### ***Hazardous and Chemical Waste Minimization***

In accordance with the requirements of Module IV, Section B.1 of Permit NM5890110518-1, Sandia annually certifies that there is a "program in place to reduce the volume and toxicity of hazardous waste generated by the facility's operation to the degree determined by the Permittee to be economically practicable" at SNL/NM. Waste minimization

efforts are promoted throughout SNL/NM by the P2 Program and investigated and implemented by line organizations with the support and technical assistance of the P2 Program.

### ***Hazardous and Chemical Recycling***

Sandia recycles all categories of hazardous and chemical waste, where feasible. RCRA recycled waste includes various batteries, silver compounds, mercury compounds, lamps, capacitors, and toxic metals. A total of 2,492 kg (or 5,483 lb) of RCRA hazardous waste and 1,877 kg (or 4,130 lb) of used oil was recycled. "Other recyclable waste" includes miscellaneous recycled categories not regulated under RCRA or TSCA. This category includes various

batteries, fluorescent lamps, various oils, and non-polychlorinated biphenyl (PCB) ballasts, lead, and capacitors. A total of 41,941 kg (or 92,270 lb) of material was recycled in this category. Waste recycled at SNL/NM in 2009 is summarized in Table 3-3.

### ***Asbestos Waste Handling***

The abatement of asbestos-containing equipment and building materials is ongoing. Removal of asbestos material is only done if the material is an inhalation hazard, or if the building is slated to be torn down or renovated. Typical asbestos-containing building materials are contained in floors, ceilings, and roofing tile, certain types of insulation, and other fire-retardant construction materials.

**TABLE 3-2. Waste Shipped By the NM HWMF in 2009**

Waste Categories Handled at the HWMF <sup>a</sup>	2009 Waste Shipped	
	(kg)	(lbs)
<b><i>RCRA</i></b>		
<b>Hazardous waste</b>	59,712	131,366
<b>Hazardous waste</b> (generated by ER Project)	0	0
<b>Hazardous waste</b> (recycled)	2,492	5,483
<b>Total</b>	<b>62,204</b>	<b>136,849</b>
<b><i>TSCA</i></b>		
<b>PCB</b> (recycled)	1,948	4,286
<b>PCB</b>	154	338
<b>PCB/hazardous waste mixture</b>	4	9
<b>Total</b>	<b>2,106</b>	<b>4,633</b>
<b><i>OTHER</i></b>		
<b>Infectious waste</b>	330	726
<b>Asbestos</b>	156,943	345,274
<b>Other chemical waste<sup>b</sup></b>	129,963	285,918
<b>Other chemical waste<sup>b</sup></b> (Generated by ER Project)	0	0
<b>Used oil</b> (recycled)	1,877	4,130
<b>Used oil</b>	6	14
<b>Other</b> (recycled) – various batteries, fluorescent lamps, and non-PCB ballasts, capacitors, and oils	41,941	92,270
<b>Total</b>	<b>331,060</b>	<b>728,332</b>
<b>Total Waste and Recyclables Shipped</b>	<b>395,370</b>	<b>869,814</b>

**NOTES:** <sup>a</sup> Not all wastes listed in this table are physically managed at the HWMF

<sup>b</sup> Other chemical waste includes special waste and industrial solid waste

HWMF = Hazardous Waste Management Facility

RCRA = Resource Conservation and Recovery Act

ER = Environmental Restoration

kg = kilograms

lbs = pounds

TSCA = Toxic Substances Control Act (primarily regulates PCBs)

PCB = Polychlorinated Biphenyl



**TABLE 3-3. Categories of Waste Recycled at SNL/NM in 2009**

Material	Pounds
Chemicals Exchanged	73
Binders	273
Antifreeze/Coolant	440
Granular Activated Carbon	6,000
Plastics	11,373
Light Bulbs	20,327
Tires	25,700
Toner / Ink Cartridges	27,393
Carpet	38,088
Batteries	69,288
Oil / Grease / Fuel	121,936
Wood	319,270
Computers/Electronics	531,269
Paper/Cardboard	839,276
Metals	3,032,017
Concrete/Asphalt	36,784,400

Similarly, in instances where laboratory equipment has asbestos-containing material in a non-friable form (which poses no inhalation risk), the item(s) in question are allowed to remain in service or are redistributed through the property reapplication program. Typical asbestos waste generated from equipment abatement consists of fume hoods, ovens, and cable insulation. In 2009, a total of 156,943 kg (or 345,274 lb) of asbestos waste was generated and disposed.

#### ***PCB Handling***

PCBs are a class of organic chemicals that were widely used in industrial applications due to their practical physical and chemical properties. Use of PCBs included dielectric fluids (used in transformers, capacitors, etc.), hydraulic fluids, and other applications requiring stable, fire retardant materials. The domestic production and distribution of PCBs was banned in 1979, and their use continues to be phased out.

Sandia has identified and replaced most PCBs and PCB-containing equipment. Previously, the largest

quantity of regulated PCB-containing equipment in use at SNL/NM was capacitors contained inside fluorescent light ballasts manufactured before July 2, 1979. These have been almost completely eliminated due to an aggressive lighting retrofit program instituted in 1998. This program has removed all known PCB-containing ballasts running T12 lamps, replacing them with energy efficient, electronic (non-PCB) ballasts and T8 lamp technology. Other than fluorescent light ballasts, six PCB regulated items remain in use at SNL/NM. There are also six discrete areas of existing PCB spill contamination on concrete floors (from old transformers that have since been removed from service) which are being actively managed in compliance with an EPA/TSCA use authorization.

In 2009, Sandia submitted a One-Year Exception Report to the EPA Region Six Administrator for a PCB waste item because it was disposed greater than one year from the removed from service for disposal date and the Certificate of Destruction was not received within 13 months.

In 2009, a total of 2,106 kg (4,633 lb) of PCB waste was shipped from the HWMF for disposal and recycle (Table 3-2).

#### ***Explosive Waste***

Explosive waste generated at SNL/NM is generally managed at the point of generation until it can be shipped to a treatment facility. Sandia operates the TTF, a unit in TA-III permitted for the treatment of certain explosive waste generated by research and test activities at an adjacent facility. In 2009, 260 kg (572 lb) of waste was treated at the TTF. In 2009, 12,823 kg (28,244 lb) of other explosive waste was transferred to KAFB for treatment. Also in 2009, Sandia shipped four excess Sprint rocket motors, weighing a total of 13,538 kg (29,819 lb), to a permitted out-of-state military installation for treatment by open detonation.

#### ***3.4.2 Radioactive Waste and MW***

The RMWMF, AHCF, and MSB are used to manage LLW, MW, transuranic (TRU) waste, and mixed TRU waste (MTRU). The waste processing functions at the RMWMF include waste characterization, segregation, treatment, packaging, storage, and shipment to permitted off-site facilities. Wastes are stored at the MSB. The AHCF was not operational and did not manage wastes during 2009.

No high-level radioactive waste (HLW) is generated at SNL/NM. Although Sandia operates several nuclear reactors, no spent fuel has ever been produced since the original fuel rods are still viable. Furthermore, because SNL/NM is not a power producing utility, any spent fuel that would eventually be removed from the research reactors would not be classified as HLW.

All LLW, TRU, MTRU, and MW generators must contact the Radioactive Waste Program to obtain prior approval before generating waste; this allows development of a pathway for waste treatment and disposal before the waste is generated. The LLW and MW managed at the RMWMF is generated through a variety of processes. During 2009, both LLW and MW consisted of legacy wastes (wastes originally generated between 1990 and 1998), newly generated wastes from production processes, wastes from ER activities, and wastes generated during waste management activities at the RMWMF. MW also included wastes that had been treated at the RMWMF. TRU and MTRU wastes consisted of legacy wastes.

Applicable DOE Orders and regulations for LLW and MW management are listed in Chapter 9. Normally, radioactive waste is shipped off-site within a one-year time frame. This is similar to the requirements for hazardous waste and MW. Some LLW may remain on-site longer than one year. Generally, this is to achieve full utilization of transport vehicles by ensuring that vehicles are full prior to leaving the site.

#### ***SNL/NM's Radioactive Waste and MW***

LLW is primarily contaminated with isotopes of strontium, plutonium, cobalt, americium, thorium, cesium, tritium, and uranium (plutonium and americium in LLW are below the activity level designated for TRU waste). Sandia's LLW inventory generally consists of laboratory waste, Decontamination and Demolition (D&D) debris, and personnel protection equipment (PPE).

MW generally consists of a radioactive component with the addition of RCRA-hazardous component such as a metal or solvent. TRU waste may derive from sealed instrument sources, D&D waste, PPE, and laboratory waste. The radioactive component in TRU is generally americium, plutonium, neptunium, and curium.

#### ***2009 Activities at the RMWMF and MSB***

In 2009, all four types of waste (LLW, MW, TRU, and MTRU) were stored at the RMWMF and MSB. On-site treatment at the RMWMF included chemical deactivation (including neutralization), thermal deactivation, stabilization and solidification, macro-encapsulation, and physical treatment (volume reduction).

In 2009, the RMWMF shipped 8,088 kg (17,825 lb) of LLW, and 1,480 kg (3,262 lb) of MW to permitted off-site facilities for treatment and/or disposal. A five-year summary of radioactive waste shipped from SNL/NM is shown in Figure 3-1.

In 2009, 2,060 kg (4,534 lb) of MW was treated at the RMWMF to meet applicable hazardous waste treatment standards. Of the treated waste, 108 kg (343 lb) were rendered non-hazardous. The treated wastes were then stored at the RMWMF or MSB, or they were shipped to permitted off-site facilities.

TRU and MTRU were stored at SNL/NM during 2009. DOE and Sandia plan to send the TRU and MTRU to the Waste Isolation Pilot Plant (WIPP) through the Advanced Mixed Waste Treatment Project (AMWTP) in Idaho for final disposal.

### ***3.4.3 MW Regulatory Status***

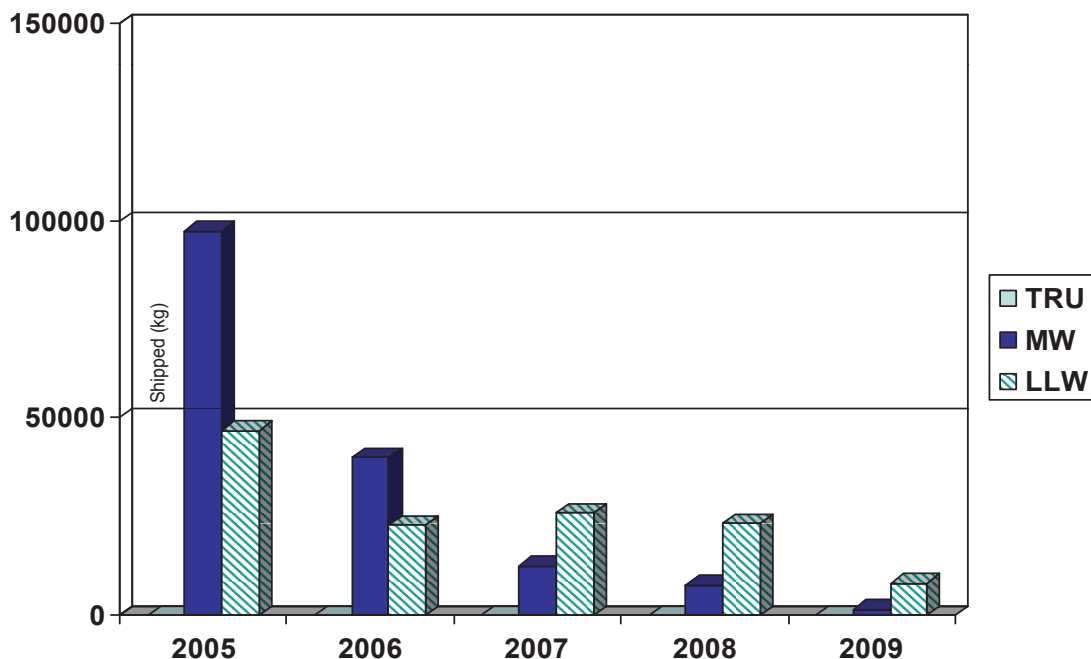
As discussed in Section 2.1.4, Sandia manages MW that is subject to the Federal Facilities Compliance Order (FFCO) (NMED 2004). The requirements include:

- Deadlines for processing and/or disposing of various types of waste, and
- Providing an annual update of activities and the current inventory of stored waste still on-site.

SNL/NM compliance history regarding MW and the FFCO is shown in Chapter 9, Table 9-3.

#### ***MW Treatment***

Chapter 9, Table 9-4 lists the current MW categories (TG-1 to TG-27, including TRU/MW) with the preferred treatment options and the status for each category. Five of the treatment technologies listed in Table 9-4 are performed on-site at the RMWMF as described in the current RCRA Part B permit request



**FIGURE 3-1.** Five Year Summary of Total Radioactive Waste Shipped at SNL/NM

(most recently updated in March 2007) and in the draft permit issued by NMED in August 2007.

#### ***MW Inventory in 2009***

At the end of 2009, the majority of MW stored on-site consisted of inorganic debris and radioactive metallic objects with hazardous waste constituents and wastes that have been treated to meet hazardous waste treatment standards.

#### **3.4.4 Solid Waste**

The primary function of the SWTF is to collect, process, and ship for disposal solid waste from SNL/NM in compliance with all applicable regulations. The SWTF primarily accepts solid waste. It does not accept hazardous, radioactive, residential, or food service wastes.

#### ***SWTF Operations***

Processing solid waste at the SWTF consists of screening 100 percent of the waste for prohibited materials, which are removed if identified. The waste is further screened when it is placed on a conveyor that passes under a radiation detection system. If radiation is detected above background levels, the conveyor is automatically shut down and the source is investigated. Note that screening 100 percent of the solid waste is not a requirement of any regulations, and

is a good faith effort to prevent prohibited materials from inadvertently ending up in the landfill. The conveyor then feeds the waste into a baler where it is compressed into desk-sized bales. The bales are weighed, individually tracked, and loaded into a trailer for transport to a local landfill. The SWTF also processes and ships (but does not collect) solid waste from Kirtland Air Force Base (KAFB) and DOE/NNSA.

In 2009, the SWTF received 775,821 kg (1,708,856 lb) of SNL/NM solid waste and 965,533 kg (2,126,724 lb) of KAFB and DOE/NNSA solid waste.

#### ***Recyclables***

The secondary function of the SWTF is to collect, process (screen, bale, and track), market, and ship the following recyclable materials from SNL/NM: cardboard, white paper, mixed paper, aluminum cans, scrap metals, printer consumables, and plastics (Table 3-3). Proceeds from the sale of recyclable materials are used to reinvest in the recycling program. The SWTF also provides some recycling support for KAFB and DOE/NNSA.

In support of small SNL/NM construction and demolition projects, the Construction and Demolition (C&D) Recycle Center accepts small quantities of C&D waste, but it is managed separately from the

solid waste. The C&D Recycle Center provides contractors of small C&D projects a location to recycle cardboard, wood, and scrap metal.

### **3.5 P2 Program**

#### **3.5.1 Program Scope**

The P2 Program provides guidance and technical support to reduce waste generation and resource consumption and to help improve the overall efficiency of processes and organizations within SNL/NM. To achieve continuous improvement, the program annually sets targets and activities for recycling, waste reduction, environmentally preferable purchasing (EPP), and reduction of environmental releases. The P2 Program is directed and guided by federal requirements, including DOE directives.

The P2 Program partners with numerous organizations at SNL/NM, including ES&H, Facilities Engineering and Procurement. P2 Program staff research waste reduction technologies and strategies applicable to SNL/NM work processes, research avenues to reuse and recycle waste streams currently landfilled or incinerated, and assists with cost-effective implementation for new waste reduction or recycling initiatives.

#### **3.5.2 Awareness and Outreach**

The P2 staff conducts awareness programs and outreach activities that promote and teach P2 strategies and technologies to waste generators. P2 staff also submit nominations for federal (DOE and EPA) and other award programs. Internal articles and notices are regularly created that showcase P2 activities and awards to Sandia for its P2 accomplishments. P2 information and its successes can be found at the following website:

<http://p2.sandia.gov>

The P2 Program supports two large awareness events each year. The first is Earth Day. In 2009, Sandia's Earth Day event was held on April 22 at the Steve Schiff Auditorium. The theme was "Every Little Bit Counts". An estimated 375 people attended the keynote talk by Judith Phillips on the topic of sustainable landscapes. During and after the talk, about 1,000 people checked out the 16 displays in the Auditorium Lobby. Many

groups from Sandia and non-governmental groups participated by setting up booths reinforcing the theme and providing information on how people can reduce their environmental impact by waste reduction, recycling and making environmentally preferable ("green") purchases. The other large event is the annual Earth, Wind and Sun event in July. P2 hosted double booths at each event presenting recycling and green purchasing topics, highlighting Sandia's programs and what resources are available in the community.

P2 staff routinely give presentations at conferences, professional society meetings, and other organized events to disseminate and share Sandia-specific P2 knowledge and experience. In 2009, P2 staff gave the following presentations:

- "Expanding Recycling Capabilities and Opportunities at SNL/NM", "EPEAT-Gold by Default" and "Closed Loop Recycling" at the OFEE Annual Symposium (June);
- "Pollution Prevention and Property Reapplication at SNL/NM" at the National Property Management Association, Duke City Chapter, Fall 2009 Seminar (October);
- "SNL Construction Waste Management (CWM) Program" at the Air and Waste Management Association, New Mexico Chapter Meeting (November); and
- "Sustainability and Going Full Circle" by P2 student intern at Rio Rancho Middle School, in support of Recycling Awareness Month, proclaimed by NM Recycling Coalition (November).

In May of 2009, P2 staff presented a booth at the Albuquerque Public Schools (APS) Alternative Fuels Challenge. The purpose of the event was to educate elementary/middle school students from around the state about renewable energies. The P2 booth promoted energy savings associated with recycling. The P2 booth demonstrated, in terms of gasoline, the amount of energy saved from recycling efforts in the U.S., the State of New Mexico, and the City of Albuquerque (COA) during 2007.

### **P2 Awards**

Over the past several years, Sandia has received numerous awards for P2 accomplishments:

#### **2009 Awards**

- 2009 National Nuclear Security Administration (NNSA) Best-in-Class Award for Electronics Stewardship
- DOE E-Star Award for nomination titled "EPEAT Gold by Default"
- NNSA Environmental Stewardship Award for a New Application of Recycled Concrete and Asphalt
- Federal Electronics Reuse and Recycling Campaign Regional Award

#### **2008 Awards**

- NNSA Best-in-Class Award for Waste Minimization during Decontamination and Demolition (D&D) Projects
- Plus a Department of Energy Environmental Sustainability Star (E-Star) Award (in 2009) (*replaces previous DOE P2 Star Award process*)
- NNSA Best-in-Class Award for Waste Minimization of De-Ionized Water during Semiconductor Fabrication
- NNSA Environmental Stewardship Award for expanded Recycling Infrastructure
- NNSA Environmental Stewardship Award for Green Purchasing of Computers
- NNSA Environmental Stewardship Award for One-Man Waste Minimization Saving >\$110,000
- Federal Electronics Challenge Bronze Award for Life-Cycle Electronics Stewardship
- Federal Electronics Reuse and Recycling Campaign Regional Award

### **3.5.3 Environmentally Preferable Purchasing (EPP) Program**

Sandia looks to procure environmentally preferable products and partners with suppliers who share a similar vision of environmental stewardship. P2 works with procurement, suppliers, and purchasers to make green products preferred products at the

labs. The purchase of recycled content products is one way SNL/NM supports the recycling industry and limits our contribution to the demand for virgin materials and the energy intensive processing required to turn them into saleable goods. Sandia's preference for triple bottom line products, those that consider cost, effectiveness, and environmental impact is communicated to suppliers through contract language and regular communication specifically concerning the topic of green products. This communication with suppliers is passed on to manufacturers who make responsibly manufactured products increasingly and more competitively available.

Particularly successful to this end has been the Sandia toner supply arrangement. The contract indicates that a remanufactured cartridge is to be first offered for any model available. Remanufactured cartridges save the corporation money and also keep plastics from the landfill. The janitorial supply contract provides recycled content items for all paper products and plastic bags used on-site. Our suppliers green catalog of office products is offered to all administrative assistants and purchasers by P2 as a first source for ordering product; the entire catalog is comprised of recycled content and other environmentally preferable products.

Sandia tracks the purchase of these and over 50 other product types, in eight categories cited by the EPA's Comprehensive Procurement Guidelines (CPG). The CPG is a government-wide initiative to create markets for recycled content products, provide a resource for government agencies be aware of recycled content products available, and also provide information on how much recycled content a particular item should have. In 2009, Sandia achieved 46 percent recycled content purchases overall, on over \$5 million in CPG applicable purchases. Work continues to move these environmentally preferred products from optional listings to required listings. CPG information can be found at the following website:

<http://www.epa.gov/epawaste/conserve/tools/cpg/index.htm>

Recycled content purchases are also tracked for items not yet listed on the CPG, but available through SNL/NM suppliers. Last year, a list of 15 items was offered to DOE HQ and EPA Headquarters (HQ) for consideration for CPG listing by SNL P2. Sandia is



a regular participant in teleconferences that span the DOE and federal complex to share experiences with environmentally preferable products and companies. Sharing success on effective green products and weeding out those “green-washing” companies are both necessary and beneficial functions of SNL/NM involvement on these calls. With the ever growing market to “green” products available, it is essential to have a forum for discussion on what is good and what is not so good and also organizations that are willing to try new things.

### **3.5.4 Waste Reduction**

Sandia continues to work on reducing the quantities of waste generated.

During the course of 2009, P2 lead a Lean/Six Sigma 6S (sort, simplify, shine, safety, standardize, sustain) event to streamline the solid waste dumpster infrastructure on-site. A geographic information system (GIS) was built to track and manage solid waste and recycling operations; many excess dumpsters were recalled from around the site; dilapidated dumpsters were recycled; excess dumpsters were repainted and labeled for new service as recycle dumpsters to collect cardboard and mixed paper; undersized recycle dumpsters were upgraded; dumpsters were logically grouped in sets of solid waste, cardboard and mixed paper as appropriate; and many gaps in the infrastructure distribution were filled.

In September 2009, P2 contracted a private firm to conduct a waste assessment of the SNL/NM-leased office space in the off-site Sandia Science & Technology Park (SS&TP). This included Sandia’s largest occupied office building, Innovation Parkway Office Center (IPOC), and the smaller International Programs Building (IPB). The waste being generated by the office workers in the SS&TP was not previously being tracked. The waste assessment also included getting a revised estimate for the volume and weight of putrescible waste being generated by the large on-site Thunderbird Café. A Pollution Prevention Opportunity Assessment (PPOA) of the Thunderbird Café in 2005 made a visual estimate of the waste stream, but the collected data from the 2009 waste assessment reduced the claimed amount of trash by 75 percent.

In December 2009, P2 completed two other studies. The first was a PPOA on operations at Reapplication Services. The second was a Recycling Opportunity Assessment (ROA). This was an update to a 2004 ROA that outlined 12 of SNL/NM’s recycle streams. The 2009 ROA provided a status to approximately 50 recycle streams, and outlined actions to improve each recycle stream as appropriate.

### **3.5.5 Electronics Stewardship**

Electronics Stewardship covers the lifecycle impacts of information technology equipment and is an area of expanding interest in the DOE and federal government as a whole. The impacts of electronics use are many but include a significant portion of an organization’s energy use, toxics contributed to the waste stream, and the opportunity for “e-cycling” or capture of the high value materials for use in new equipment. Electronics life cycle management is divided into three stages: purchase, operations and end of life management. Each of these stages has specific impacts; the purpose of Sandia electronics stewardship efforts is to address these individually. The SNL/NM P2 group is tasked with monitoring and facilitating improvements to Sandia performance at all three of these stages.

Sandia is a continuing partner in the Federal Electronics Challenge (FEC) program. The FEC promotes a comprehensive approach to reducing the environmental impacts of electronics assets ownership. One part of that approach is use of the Electronic Product Environmental Assessment Tool (EPEAT) in the purchase of electronic equipment. EPEAT is a set of criteria in eight different electronics to determine the environmental attributes of a particular electronic office product. At this point, EPEAT is only targeting computer desktops/towers, notebook computers (laptops) and monitors. By integrating EPEAT into the Preferred Systems qualifications, Sandia has achieved exceptional compliance in recent years. For Fiscal Year (FY) 2009 over 80 percent of SNL/NM purchases were EPEAT Gold compliant. As more equipment becomes available with higher EPEAT ratings, Sandia procurement and computing groups have accordingly raised requirements for all organizational purchases. For FY 2009 over 99 percent of laptops, desktops and monitors purchased were EPEAT Silver and only 32 of over 8,000 units were not EPEAT certified.



Operations are currently an aspect of electronics stewardship that has a lot to do with people. All EPEAT certified equipment is Energy Star compliant but it is up to each user to take advantage of energy saving features. There are “grass roots” efforts by green teams at SNL/NM to educate individuals about cost savings associated with the use of Energy Star features. Use of power strips is encouraged for management of all office electronics by green teams around the lab and “lights out” type campaigns occur periodically. For FY 2010, Sandia has just purchased a comprehensive power management software suite that will allow for precise power management real use reporting of all networked equipment. This will remove much of the user dependence from power savings, and get closer to a lowest power scenario, site-wide.

With the size of the population and movement within SNL/NM, end of life for computer equipment often means the beginning of life at a new desk. If a unit is not immediately reapplied to another individual it enters the Property Reapplication system. Since 2007, Property Reapplication has separated e-scrap, for shipment to an approved electronics recycler that dismantles and segregates the material for distribution back to the raw materials market. SNL/NM’s e-cyclers are visited and reviewed to ensure their compliance with all federal regulations. The recycling rate for our Information Technology (IT) equipment continues to stand at 100 percent, and reduces environmental impacts by keeping used material out of the landfill and providing valuable raw materials to the next generation of computing machines. Considering the nature of Sandia work and the associated number of computing systems purchased annually, this practice represents a dramatic reduction of what would otherwise be hazardous waste. A total of 239,006 lb of e-scrap was recycled by SNL/NM in 2009.

### **3.5.6 Recycling Overview**

Sandia accounts for its recycling in two separate categories: routine, which is waste from recurring and/or typical office operations, and non-routine, which is from intermittent clean-up and construction activities. In 2009, 57 percent of Sandia’s routine waste and 89 percent of non-routine waste was recycled. This diverted 21,889 tons of waste from local landfills. See Table 3-3 for the breakdown of recycling by waste stream.

This year the major recycling initiatives included continuing to increase the amount of recycle mixed paper, launching a pilot of alkaline and carbon-zinc battery recycling, ramping up of plastics recycling, and pursuing the creation of a new product called conphalt, a mixture of crushed concrete and asphalt.

Mixed paper recycling increased by 15,000 lb over 2008 to more than 100,000 lb in 2009. Volunteers continue to move all of the material out of buildings to distributed yellow dumpsters designated for mixed paper. Nine new mixed paper dumpsters were deployed in 2009 bringing the total to 30 locations. These dumpsters also became the new distributed drop off locations for the collection of Styrofoam. Early in 2009, Styrofoam began to be collected for reuse by a local construction company. Later in the year, recycling revenues were used to purchase a new piece of equipment that grinds and compacts several types of packing foam into easily transported logs that are of value to plastics recyclers. This is similar to making bales of paper or cardboard for efficient transport to recyclers. Other plastics being collected for recycle starting in 2009 include shrink wrap and rigid polypropylene (#5) plastic. The first test bale of shrink wrap weighed 634 lb. At the 2009 Earth Day event, the pilot process for recycling alkaline and carbon-zinc batteries was launched. Nearly 2,300 of these batteries were brought to Earth Day for recycle, and over 150 collection bins have since been distributed across the site.

The P2 Program conducted a crushing event at the Concrete and Asphalt Recycling Area (CARA) in 2009. The CARA is an accumulation site for concrete and asphalt rubble generated by Sandia construction-like activities. The rubble is periodically crushed to meet specific aggregate material requirements, and becomes a valuable commodity for reuse at Sandia for applications such as base course beneath asphalt pavement, paving material for remote dirt roads, and as general surface cover. Projects using crushed aggregate material reimburse the P2 program based on the quantities used, thus providing a financially self-sustaining operation. Approximately 17,600 tons (or 35,200,000 lb) of concrete and asphalt were crushed in 2009, representing the largest recycle stream at Sandia.

Noteworthy applications of crushed aggregate materials during 2009 include a large roadway reconstruction project in TA-I that consumed nearly

5,500 tons of crushed concrete base course and a remote-site dirt road re-pavement project in TA-III that consumed 2,160 tons of conphalt (a mixture of crushed concrete and asphalt). Resurfacing dirt roads using conphalt is a new application at Sandia with numerous environmental benefits. The conphalt material creates a more stable road surface that reduces fugitive dust emissions, water-based dust suppression requirements, and chemical dust suppression applications. As a result, the overall maintenance cost for conphalt-surfaced roads is reduced.

Additional FY 2010 project customers have been identified as the crushed aggregate materials become more known and popular within the Sandia Facilities organization. An additional one-mile span of remote site dirt road surface will be resurfaced with conphalt in FY 2010. Additional roadway reconstruction work in TA-I during FY 2010 will use crushed aggregate base course.

A significant improvement in the ability to recycle wood debris was accomplished by P2 in FY 2009. A new wood recycling vendor established an operation in Albuquerque. This new vendor's acceptance criterion for wood debris is more robust than the vendor previously used by Sandia. Previously, engineered wood scrap (plywood, particle boards, etc.) and wood scrap containing metal fasteners or other attached debris were unacceptable for recycling. The new vendor accepts these materials and performs whatever processing is necessary to remove any contaminating materials (such as fasteners, labels, etc.). The ability of the new wood recycling vendor to accept more varied types of wood debris enabled Sandia to increase the quantity of wood recycled from 15 tons in FY 2008 to over 70 tons in FY 2009.

A study was conducted for the Sandia/NM Reapplication Services during FY 2009 to evaluate the processes for managing property and materials for potential opportunities to improve reuse and recycling. The primary objectives of the study was to investigate and evaluate the standard practices employed for managing excess property and materials at Reapplication Services and identify and implement, as appropriate, opportunities measures to reduce generation of solid waste, maximize recycling, and increase the potential reuse excess property and materials by Sandia personnel. The majority of opportunity measures identified during the

investigation and evaluation process were implemented as appropriate. The opportunity measures identified and implemented include:

- Removable Electronic Media (REM) Recycling
- Shrink Wrap Recycling
- Transparency Recycling
- White & Mixed Paper Recycling
- Mixed Plastics Recycling
- Improved Reapplication of Liquid Crystal Display (LCD) Monitors
- Recordkeeping for CPUs and CRTs Packaging for Recycle
- CPU and CRT Packaging for Recycle
- Establish Metal Segregation Area at the Reapplication Yard

In 2009, the P2 Program made further progress in its major focus areas of Waste Reduction, Electronics Stewardship, Environmentally Preferable Purchasing, Reuse/Recycling and Awareness programs, with the intent being to institutionalize these environmental sustainability approaches and actions into the daily work activities of Sandia mission-related and support programs. The P2 Program has set new targets for 2010, in the vein of continuous improvement. The 2010 environmental sustainability targets for the P2 Program include increasing the recycle rate of hazardous waste, packing foams and mixed paper; introducing new biobased products and increasing the purchase of biobased penetrating lubricants and vacuum pump oil; developing a mercury awareness and reduction program; and consolidating and reducing the number of computer printers purchased and supported.

### **3.6 Biological Control Activities**

The Biological Control Activity provides customer support related to animal control issues and compiles information on pesticide use at SNL/NM. Animal control support includes providing general information and resolving issues related to removing nuisance animals. Requests for assistance in resolving nuisance animal problems are relayed and documented through Sandia's Facilities Telecon Organization. This effort may involve interacting, as necessary, with the U.S. Air Force (USAF) and State of New Mexico agencies to resolve animal control issues. The Biological Control Activity also involves providing support in addressing

animal-borne disease concerns (e.g., Hantavirus) through activities including disinfecting, sanitizing, and cleaning up areas infested with rodents or pigeons.

Pesticide use at SNL/NM includes the use of herbicides for weed control, rodenticides for controlling mice, and insecticides for the control of insects in food service and work areas. Sandia uses EPA-registered pesticides that are applied by certified pest control agencies. Material Safety Data Sheets (MSDS) and product labels for pesticides used at SNL/NM are maintained under the program. Pesticide use (product names and amounts applied) are documented in quarterly reports. Documents related to the program are listed in Chapter 9.

### **3.7 National Environmental Policy Act (NEPA) Program**

Sandia provides DOE/NNSA/SSO with technical assistance supporting compliance with NEPA and the National Historic Preservation Act (NHPA). The SNL/NM NEPA Team reviews projects for conformance to existing DOE NEPA documents and determinations. The use of the ISMS NEPA module software facilitates SNL/NM NEPA reviews, citing existing NEPA documentation as appropriate. The ISMS NEPA module also streamlines DOE/NNSA/SSO's review and determination of DOE NEPA checklists, when required, and supports QA by providing a consistent framework that makes NEPA documentation and information readily available. A DOE NEPA checklist, or an Air Force Form 813, is prepared for DOE review and determination, if the proposed action:

- Does not fall within the analysis of an existing SNL/NM NEPA document, or
- Would occur on USAF property (permitted, or requested to be permitted, for SNL/NM use).

NEPA program documents and regulations are listed in Chapter 9. See Table 3-4 for a summary of NEPA reviews that were completed in 2009.

#### ***SNL/NM Site-Wide Environmental Impact Statement (SWEIS)***

The SWEIS update process continued to undergo revision during CY 2009 to better track and evaluate environmental operational limits at both the facility and site level. To accomplish this, Environmental Planning

personnel met with representatives from SNL/NM facilities to discuss environmental operational limits (site and facility limits on parameters such as water and electricity use, waste generation, and air emissions) and their significance within the SWEIS and other NEPA coverage. Causes for exceeding operational parameters were researched and tracked. Exceedances were also put into the context of future activities; for example, whether an exceedance was a one-time event, or represented a permanent change in facility configuration or operations.

#### ***2009 NEPA Documentation***

The NEPA Team participated in the review of the following environmental documents:

1. *Draft Site-Wide Environmental Impact Statement for the Continued Operation of the Department of Energy/National Nuclear Security Administration Nevada Test Site and Off-Site Locations in the State of Nevada*, and
2. *Draft Classified Waste Landfill Excavation at Sandia National Laboratories/New Mexico*

The NEPA Team reviewed a total of 1,208 proposed projects in the ISMS NEPA module and other corporate applications. Ninety DOE NEPA checklists were transmitted to the DOE/NNSA/SSO for review and determination in 2009.

Summary data for SNL/NM NEPA reviews performed in 2009 are detailed in Table 3-4.

### **3.8 Environmental Outreach Program**

SNL/NM's Environmental Outreach Program reaches out to the community via various events, and provides environmental information to members of Sandia's workforce. The Outreach Program supports Sandia's EMS and LTES Programs. Sandia recognizes that in addition to complying with requirements, it is important to communicate with Sandia's workforce and the local community to help reduce environmental impacts at work and at home. Sandia has an integrated approach to communicate environmental awareness to its workforce via semi-annual EMS Newsletters, semi-annual LTES newsletters, awareness campaigns, and various outreach events. Sandia collaborates with numerous internal and external organizations such as

**TABLE 3-4.** Summary Data for SNL/NM NEPA Reviews Submitted to DOE/NNSA/SSO in 2009

NEPA Reviews	Review Breakouts		Quantity
Corporate NEPA Software System	Reviewed by SNL/NM NEPA Team		305
	Reviews Completed by DOE/NNSA/SSO		90
Other Corporate NEPA Reviews	Completed by SNL/NM NEPA Team		799
DOE / U.S. Air Force NEPA Documents	New Land-Use Permit Reviews	1	
	Land-Use Permit Renewal Reviews	5	
	Land-Use Permit Termination Reviews	5	
	Project-Specific Reviews	3	
	Environmental Assessments Under AF Activities	0	
	Subtotal for USAF Reviews Completed		14
<b>Grand Total of all NEPA Reviews</b>			<b>1,208</b>
Percentage of Total Reviews Requiring Submittal to DOE <i>Total DOE Reviews (90 + 14 = 104) divided by Total NEPA Reviews (1,208) =</i>			9 %

**NOTES:** NEPA = National Environmental Policy Act  
 SNL/NM = Sandia National Labs / New Mexico  
 DOE = U.S. Department of Energy  
 USAF = United States Air Force  
 % = percent

Sandia's Energy Management Team, Sandia's Long-range Development Plan Team, the COA, and the Environmental Education Association of New Mexico (EEANM).

Currently, Sandia participates in or holds several internal and external outreach and awareness events. Events conducted in FY 2009 include the Second Annual Earth, Wind and Sun Sustainability event, Teachers' Open House, Children's Water Festival, Youth Conference on the Environment; School to World, Sandia Earth Day; Family Day; and the annual EMS Excellence Awards Ceremony. Sandia also coordinates the semi-annual DOE Public Meeting. At these events, the outreach team distributes fact sheets and newsletters; when working with children, the team often demonstrates environmental education models on topics including local air quality, landfills, and watershed education. The Outreach team also encourages the Members of the Workforce and the community to provide feedback and ask questions about Sandia's environmental programs.

The Annual Youth Conference on the Environment is a free, one-day conference offered to high school students as a means to educate them on various environmental issues. In 2009, the theme of the conference was reduce, reuse, and recycle and about 150 students attended. The event was co-sponsored by Sandia, the EEANM, and the COA.

The annual EMS Excellence Awards Program recognizes Members of the Workforce who demonstrate environmental excellence in five specific categories (energy reduction/water conservation, risk mitigation/environmental protection, environmentally preferable purchasing, waste minimization, and recycling). Since its inception in 2006, the EMS Team has received over 140 nominations from individuals and teams who are contributing to Sandia's vision of EMS. For additional information, please visit the following websites:

<http://ltes.sandia.gov>  
<http://environment.sandia.gov/new/index.shtml>

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# 4.0 Terrestrial and Ecological Surveillance

## 4.1 Terrestrial Surveillance Program

Terrestrial surveillance is conducted at Sandia National Laboratories, New Mexico (SNL/NM) to detect the possible deposition or migration of contaminants to off-site locations and to determine the impact, if any, of SNL/NM's operations on human health or the environment.

The Terrestrial Surveillance Program samples surface soils, arroyo and river sediments, and vegetation from various on-site, perimeter, and off-site locations. The samples are used to detect the presence of anomalous radiological and non-radiological constituents.

Various locations have been used for sample collection for one to 20 years. When some of the older sampling locations are no longer relevant to current operations these sampling locations may be relocated and placed in areas with greater potential environmental impact. However, the total number of samples collected annually should remain approximately the same as in the past. Several significant programmatic changes have occurred over the years, and are documented in this chapter.

### 4.1.1 Program Objectives

The Terrestrial Surveillance Program is designed to meet the objectives of the U.S. Department of Energy (DOE) Order 450.1A, *Environmental Protection Program* (DOE 2008a):

- Collect and analyze samples in order to characterize environmental conditions and identify trends,
- Establish baseline (or background) levels of radiological and non-radiological constituents,
- Assess the effectiveness of Pollution Prevention (P2) and abatement programs,
- Identify new or existing environmental quality problems and their potential impacts on human health or the environment, and

- Verify compliance with applicable laws and regulations, as well as commitments made in official documents (such as Environmental Impact Statements [EIS], in accordance with the National Environmental Policy Act [NEPA]).

### *Standards for Comparison*

No regulatory limits are available to directly compare concentrations of some radiological or non-radiological constituents in surface soils, vegetation, or sediments. SNL/NM conducts statistical analyses to compare the results from on-site and perimeter samples to off-site results, and to establish trends in order to identify possible pollutants and their potential impact on human health or the environment. However, If anomalies are observed, there are various documents used for guidance with risk assessment, such as DOE Order 5400.5, *Radiation Protection of the Public and the Environment* (DOE 1993).

In addition, sample results for metals in surface soils are compared to U.S. surface soil average concentrations (Kabata-Pendias 2000), local/regional surface soil average concentrations, (Dragun and Chekiri 2005), or site-specific surface soil concentrations (Dinwiddie 1997). A summary report of metals-in-soils at SNL/NM collected annually between 1993 and 2005 has been prepared and serves as another point of reference (SNL 2006).

In summary for 2009, the mean value of non-radiological constituents in soils is less than the residential level of the State of New Mexico soil screening guidelines, with the exception of arsenic. However, the mean value for arsenic is less than the industrial level set by State of New Mexico soil screening guidelines. For an added measure of sample verification, the DOE Oversight Bureau of the New Mexico Environment Department (NMED) split samples with SNL/NM at several locations.

### *Statistical Analysis*

Samples are generally collected from fixed locations to effectively enable statistical comparisons with results from previous years. Statistical analyses are performed to determine if a specific on-site or perimeter location



differs from off-site values and to identify trends at a specific sampling location. Since multiple data points are necessary to provide an accurate view of a system, the Terrestrial Surveillance Program does not rely on the results from any single year's sampling event to characterize on-site environmental conditions. Results from a single sampling point may vary from year to year due to slight changes in sampling locations, differences in climatic conditions, and laboratory variations or errors. Therefore, as the amount of data increases, the accuracy of the characterization increases.

The results of the statistical analyses allow SNL/NM to prioritize sample locations for possible follow-up action. The prioritization process is a decision-making tool used to assist in the determination of the appropriate level of concern for each sample result. The *Statistical Analysis Prioritization Methodology* (Shyr, Herrera, and Haaker 1998) is based on two “yes or no” questions resulting in a matrix of four priority levels. The matrix is shown in Table 4-1.

In 2000, SNL/NM changed to analytical laboratories with lower detection capabilities for many of the metals. The analyses in 2009 utilized data from the same analytical laboratory since 2000.

In some instances, this qualitative inspection of the data is augmented by the graphical evaluation methodology described and documented in the *1993-2005 Metals-in-Soil Summary Report* (SNL 2006).

This enables the visual identification of anomalies in the data that stand out from the data population for the entire site, or just that location. This step is performed to ensure that anomalous data that would otherwise pass statistical scrutiny is flagged for further investigation. This is particularly useful where insufficient data exists for trending, but comparison of new data to “expected values” is desired.

#### 4.1.2 Sample Media

Samples of surface soils, arroyo and river sediments and vegetation are collected as part of the Terrestrial Surveillance Program and analyzed for radiological and non-radiological constituents.

##### Soil

Soil samples are collected to ascertain the presence or buildup of pollutants that may have been transported by air or water and deposited on the ground surface. Approximately 1,500 grams (g) of sample is collected from the top two inches of soil in accordance with SNL/NM Field Operating Procedures (FOP). In 2009, soil samples were collected from locations indicated in Tables 4-2, 4-3 and 4-4. In addition, special samples were collected for high explosive (HE) residue at four locations on the perimeter of a former land mine experimental site in Technical Area (TA) III to check for contaminants and to serve as a baseline for future reference regarding HE results in nearby soils. This location (90) has been added to Table 4-2.

**TABLE 4-1.** Decision Matrix for Determining Priority Action Levels

Priority	Are results higher than off-site?*	Is there an increasing trend?	Priority for further investigation
1	Yes	Yes	Immediate attention needed. Specific investigation planned and/or notifications made to responsible parties.
2	Yes	No	Some concern based on the level of contaminant present. Further investigation and/or notifications as necessary.
3	No	Yes	A minor concern since contaminants present are not higher than off-site averages. Further investigation and/or notifications as necessary.
4	No	No	No concern. No investigation required.

**NOTES:** Based on *Statistical Analysis Prioritization Methodology* (Shyr, Herrera, and Haaker 1998).

\*Some sites may appear higher than off-site. However, there may not be a statistically significant difference.

### ***Sediment***

Sediment samples are collected from arroyo beds and from the banks of rivers and creeks to ascertain the presence, or buildup, of pollutants deposited from surface waters. Approximately 1,500 g of sample is collected from the top two inches of soil in accordance with SNL/NM FOPs. Sediment samples were collected from locations listed in Tables 4-2, 4-3 and 4-4.

### ***Vegetation***

Vegetation is sampled to monitor for potential uptake of radioactive pollutants, which could provide an exposure pathway to foraging animals and to humans through the food chain. In actuality, human exposure to contaminants through the food chain is highly unlikely on Kirtland Air Force Base (KAFB) since there is no hunting, livestock, or commercial farming within the boundaries of the base. Approximately 500 g of sample is collected, preferably from perennial grass, by cutting back several inches of growth from the plant. If grass is not available, samples from small leafy plants may be collected. In 2009, minimal vegetation was collected due to the on-going drought.

### ***Gamma Radiation Levels***

Gamma radiation levels are measured using thermoluminescent dosimeters (TLD) to determine the impact, if any, of SNL/NM's operations on ambient radiation levels. The TLDs are changed out on a quarterly basis and processed at an on-site laboratory. TLDs were collected from locations listed in Tables 4-2, 4-3 and 4-4.

#### **4.1.3 Sampling Locations**

Occasionally, sampling locations are added or dropped for different reasons, including the start-up of a new facility or operation, closure of an existing facility or operation, additional characterization of areas with elevated concentrations or increasing trends, or other technical or budgetary reasons. These locations are shown in Figure 4-1. Locations sampled are shown in Tables 4-2, 4-3 and 4-4.

In some instances, special "sampling campaigns" (radiological or non-radiological) near operations of interest (such as described in Section 4.1.5) may be conducted in addition to, or in partial substitution for, fixed locations.

### ***On-site***

On-site locations are selected within or near areas of past or current SNL/NM operations (see Figure 4-1 and Table 4-2). Sample locations are chosen near sites with known contamination from past operations, or near facilities that have the potential to discharge radiological or non-radiological pollutants to the environment. Other considerations in the selection of sampling locations include local topography and meteorology.

### ***Perimeter***

Perimeter locations (Figure 4-1 and Table 4-3) are selected to determine if contaminants are migrating from SNL/NM sites toward the off-site community. With a few exceptions, perimeter locations are typically situated off SNL/NM property, but within the boundaries of KAFB.

### ***Off-site***

Off-site locations are selected to establish concentrations of radiological and non-radiological constituents for comparison with on-site and perimeter results (see Figure 4-2 and Table 4-4). Sample locations have been selected within a 25-mile radius of SNL/NM.

## **4.1.4 Radiological Parameters and Results**

Radiological analyses are performed on all soil, sediment, and vegetation samples and are summarized in this section. The 2009 radiological parameters and analytical results are found in Appendix C of this report (see attached CD). The detailed statistical analyses are documented in the *2009 Data Analysis in Support of the Annual Site Environmental Report* (SNL 2010).

### ***Radiological Results***

The results of the statistical analysis showed no on-site or perimeter soil or sediment locations that were Priority-1 (both higher than off-site and with an increasing trend). One location was identified as Priority-2 (higher than off-site) for cesium-137. The Priority-2 location and parameters are listed in Table 4-5. There were no Priority-3 locations identified.

#### **Cesium-137**

One perimeter location (12) continues to be identified as Priority-2 for cesium-137 in surface soils. Location 12 is located on the U.S. Forest Service (USFS) land

**TABLE 4-2. On-site Terrestrial Surveillance Locations and Sample Types**

Location Number	Sampling Location	Soil	Sediment	Vegetation	TLD
1	<sup>†</sup> Pennsylvania Ave.	X			X
2NE*	<sup>†</sup> Mixed Waste Landfill (MWL) (northeast)	X			
2NW	<sup>†</sup> MWL (northwest)	X			X
2SE	<sup>†</sup> MWL (southeast)	X			
2SW	<sup>†</sup> MWL (southwest)	X			
3	<sup>†</sup> Coyote Canyon Control	X			X
6	Technical Area (TA) III (east of water tower)	X			X
7	<sup>†</sup> Unnamed Arroyo (north of TA-V)	X			X
20	TA-IV (southwest) (KAFB Skeet Range)				X
31	TA-II Guard Gate				X
33*	<sup>†</sup> Coyote Springs	X		X	
34	<sup>†</sup> Lurance Canyon Burn Site	X			
35	Chemical Waste Landfill (CWL)	X			
41	TA-V (northeast fence)	X			X
42	TA-V (east fence)	X			X
43	TA-V (southeast fence)	X			X
45	Radioactive and Mixed Waste Management Facility (RMWMF), TA-III (northwest corner)	X			X
46	TA-II (south corner)	X			X
47	Tijeras Arroyo (east of TA-IV)				X
48	Tijeras Arroyo (east of TA-II)				X
49	Near the Explosive Components Facility (ECF)	X			
51	TA-V (north of culvert)	X			
52	TA-III, northeast of Bldgs. 6716 and 6717	X			
53*	TA-III south of long sled track	X			
54	TA-III, Bldg. 6630	X			
55	Large Melt Facility (LMF), Bldg. 9939	X			
56	TA-V, Bldg. 6588 (west corner)	X			
57	TA-IV, Bldg. 970 (northeast corner)	X			
66	KAFB Facility	X			X
72	<sup>†</sup> Arroyo del Coyote (midstream)		X		
74N*	<sup>†</sup> TA-IV, Tijeras Arroyo (midstream)		X		
75	<sup>†</sup> Arroyo del Coyote (down-gradient)		X		
76	Thunder Range (north)	X			
77	Thunder Range (south)	X			
78	School House Mesa	X			
79	<sup>†</sup> Arroyo del Coyote (up-gradient)		X		
83	<sup>†</sup> Tijeras Arroyo GW Well		X		
84	Stormwater Monitoring Point (S-10)		X		
85	<sup>†</sup> Arroyo del Coyote Cable Site		X		
86	<sup>†</sup> Corner of Wyoming and S Street	X			
90	TA-III Land Mine Test Site	X			

**NOTES:** \* = Replicate sampling locations: In addition to single samples taken for each medium, two replicate samples are collected for internal checks on comparability of sampling and analysis.

<sup>†</sup> Some locations were also analyzed for total analyte list (TAL) metals.

TLD = thermoluminescent dosimeter

**TABLE 4-3. Perimeter Terrestrial Surveillance Locations and Sample Types**

Location Number	Sampling Location	Soil	Sediment	Vegetation**	TLD
4	Isleta Reservation Gate	X			X
5	McCormick Gate	X			X
12	Northeast Perimeter	X			
16	Four Hills	X			X
18	North Perimeter Road				X
19	USGS Seismic Center Gate	X			X
39	Northwest DOE Complex				X
40	Tech Area I, northeast (by Bldg. 852)				X
58	North KAFB Housing	X			
59	Zia Park (southeast)	X			
60	<sup>†</sup> Tijeras Arroyo (down-gradient)	X	X		
61	Albuquerque International Sunport (west)	X			
63	No Sweat Boulevard	X			
64*	North Manzano Base	X			
73	<sup>†</sup> Tijeras Arroyo (up-gradient)		X		
80	Madera Canyon	X			
81	KAFB West Fence	X			X
82	Commissary	X			
87	<sup>†</sup> Mesa del Sol (North)	X			
88	<sup>†</sup> Mesa del Sol (Middle)	X			
89	<sup>†</sup> Mesa del Sol (South)	X			

**NOTES:** TLD = thermoluminescent dosimeter \*\* = No vegetation samples were collected due to the ongoing drought.

\* = Replicate sampling locations: In addition to single samples taken for each medium, two replicate samples are collected for internal checks on comparability of sampling analysis.

<sup>†</sup> Some locations were also analyzed for total analyte list (TAL) metals.

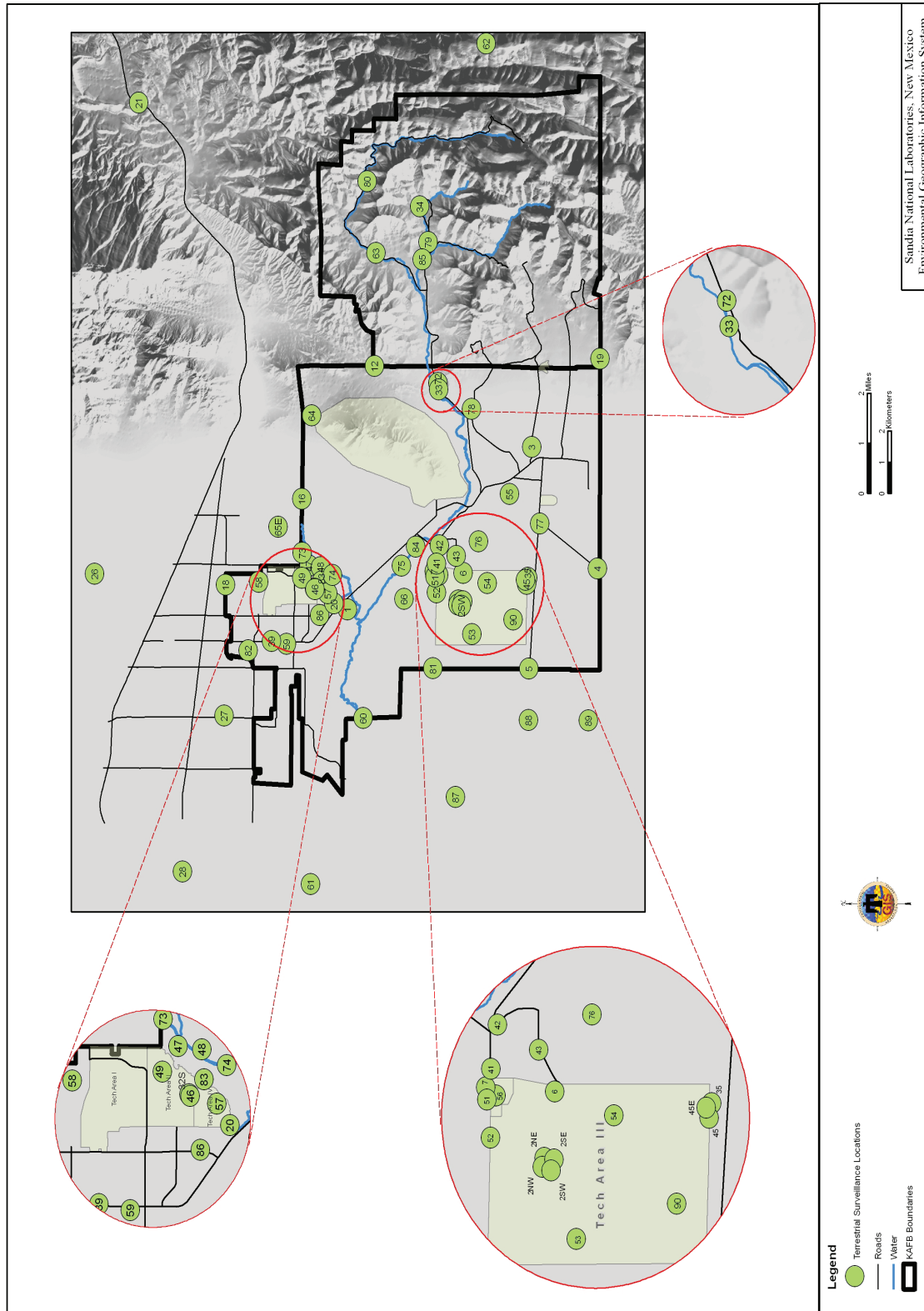
**TABLE 4-4. Off-site Terrestrial Surveillance Locations and Sample Types**

Location Number	Sampling Location	Soil	Sediment	Vegetation	TLD
8	Rio Grande, Corrales Bridge (up-gradient)	X	X	X	
9	Sedillo Hill, I-40 (east of Albuquerque)	X			
10	Oak Flats	X			X
11*	<sup>†</sup> Rio Grande, Isleta Pueblo (down-gradient)	X	X	X	X
21	Bernalillo Fire Station 10, Tijeras				X
22	Los Lunas Fire Station				X
23	Rio Rancho Fire Station, 19th Ave.				X
24	Corrales Fire Station				X
25	Placitas Fire Station	X		X	X
26	Albuquerque Fire Station 9, Menaul NE				X
27	Albuquerque Fire Station 11, Southern SE				X
28	Albuquerque Fire Station 2, High SE				X
29	Albuquerque Fire Station 7, 47th NW				X
30	Albuquerque Fire Station 6, Griegos NW				X
62*	East resident	X			
68	Las Huertas Creek		X		

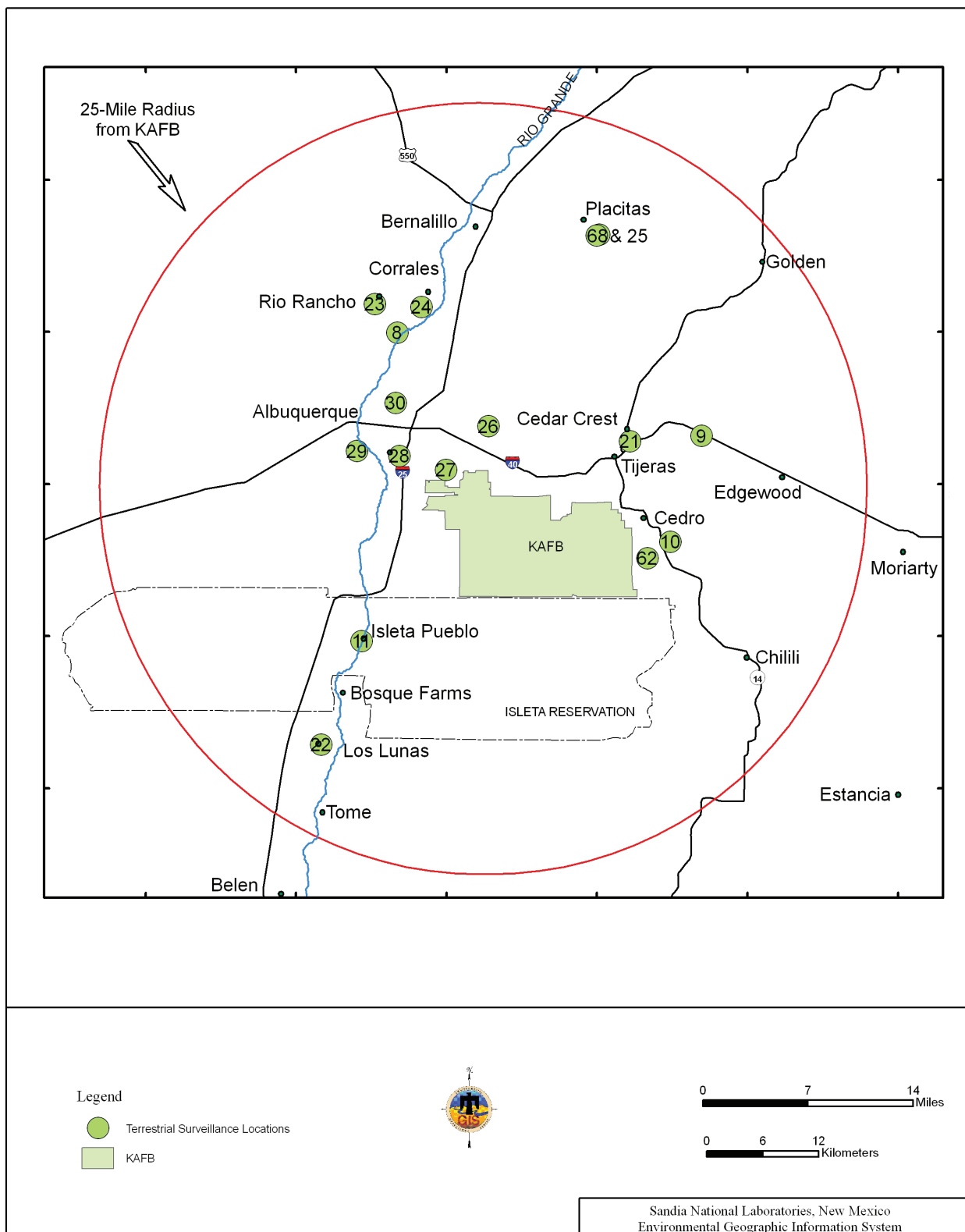
**NOTES:** TLD = thermoluminescent dosimeter

\* = Replicate sampling locations: In addition to single samples taken for each medium, two replicate samples are collected for internal checks on comparability of sampling analysis.

<sup>†</sup> Some locations were also analyzed for total analyte list (TAL) metals.



**FIGURE 4-1.** Terrestrial Surveillance Program On-site and Perimeter Sampling Locations.  
On-site locations are within areas of SNL/NM operations. Perimeter locations are located both on and off KAFB property.



**FIGURE 4-2.** Terrestrial Surveillance Program Off-site Sampling Locations



withdrawn area. This location is at a slightly higher elevation, which receives greater precipitation and results in slightly higher cesium-137 levels from fallout. Cesium-137 is prevalent in surface soils worldwide as a result of historical nuclear weapons testing. Over the past 10 years, the values for cesium-137 at these perimeter locations ranged from 0.07 to 1.82 picocuries per gram (pCi/g). However, these levels are not cause for concern.

All sediment sample locations were identified as Priority-4 (consistent with off-site results and no increasing trends) for cesium-137.

#### Tritium

Tritium is not a significant indicator radionuclide for operations at SNL/NM, and the low soil moisture in the area will always make low-activity assay difficult. There was no unusual tritium concentrations noted for any of the soil or sediment samples collected.

#### Total Uranium

No sediment locations were identified as Priority-1, Priority-2 or Priority-3 for total uranium.

#### TLD

TLD exposure by quarter and the exposure rate for each location class for 2009 is shown in Appendix C (see attached CD). The exposure rate summary statistics for each location class is also in Appendix C. In 2009, all TLDs were collected every quarter. If a TLD is not collected for a quarter, it is deleted from the statistical analysis.

Data for 2000 through 2009 were analyzed to determine if any statistical differences were observed for either location class (on-site, perimeter, or community) or year. If a TLD was missing a quarter's sample in any year of interest, it was deleted from

the statistical analysis. Operational locations are also excluded from the statistical analysis. There was no statistical difference between on-site, perimeter, and off-site locations. Table 4-6 shows the overall exposure rate summary statistics for 2000 through 2009. Figure 4-3 shows the TLD exposure rates by year and location class.

### **4.1.5 Non-Radiological Parameters and Results**

In May, routine samples were collected in the spring at for trending analysis. In June, soil at four perimeter locations at a site where (un-fused) land mine experimentation was formerly conducted, was sampled for baseline characterization of any HE. This sampling was also performed to determine if past activities at the site had any impact on human health or the environment. Since the inactive land mines remain buried at the site, this sampling serves to document baseline HE conditions in soil that remains in the area from historic testing (and that there is no evidence that HE has leaked from the buried land mines still present). A new sampling location (S-90) has been added near this area.

Baseline environmental monitoring data, collected from soil samples within the study areas, indicate that currently there is no unusual contamination of soils with target analyte list (TAL) metals or HE compounds. With the exception of arsenic, none of the analyte concentrations detected in the site soils exceed NMED Soil Screening Levels (SSL) for industrial/occupational land use. In all but five out of 43 samples, the arsenic concentrations (0.44 to 8.1 milligrams per kilogram [mg/kg]) did not exceed NMED residential SSLs. Based on process knowledge of site activities, these arsenic concentrations are most likely naturally occurring.

**TABLE 4-5. Radiological Results Summary Statistics for Sample Locations (2000-2009)**  
Noted as Priority-2 During 2009

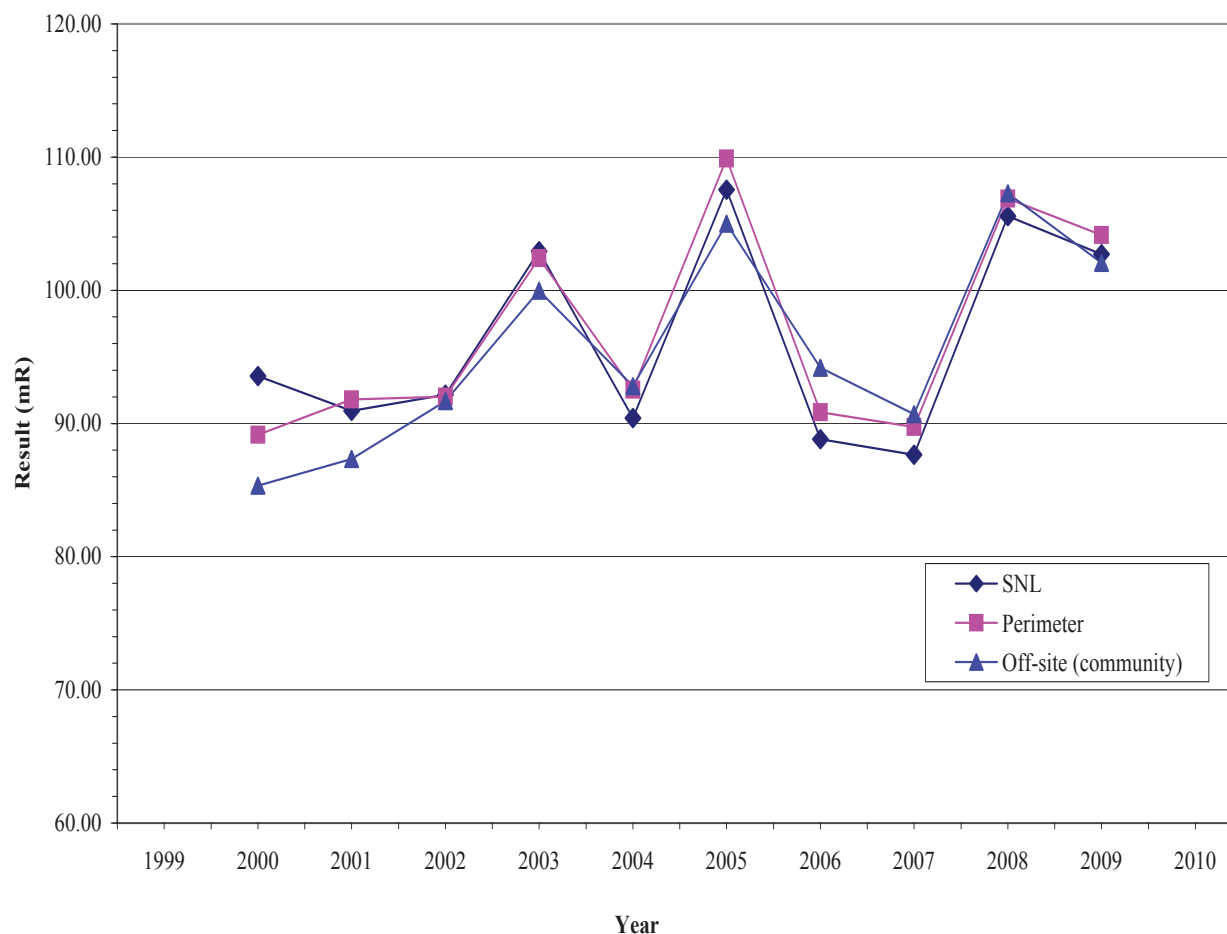
Sample Media	Analyte	Units	Location	Number of Samples	Average	Std Dev	Minimum	Maximum
Soil	Cesium-137	pCi/g	12	10	1.06	0.56	0.07	1.82

**NOTES:** Std Dev = Standard Deviation  
pCi/g = picocurie per gram  
Data presented is for ten years.

**TABLE 4-6.** Summary Statistics for TLD Exposure Rates, 2000 – 2009

Location Class	No. of Obs	Units	Mean	Median	Std Dev	Minimum	Maximum
Off-site (community)	115	mR/hr	95.6	94.2	13.9	73.2	147.6
Perimeter	77	mR/hr	97.2	97.1	11.3	78.5	132.2
On-site	135	mR/hr	96.4	94.8	9.1	80.9	119.7

**NOTE:** mR/hr = milliroentgen per hour ( $10^{-3}$  roentgen per hour)  
Std Dev = Standard deviation  
Obs = Observations  
TLD = thermoluminescent dosimeter



**FIGURE 4-3.** TLD Exposure Rates by Year and Location Class

The results are consistent with Table 4-7, and in no instance do they exceed NMED industrial/occupational SSLs.

### Site-wide Non-Radiological Results

No sampling location was noted to be Priority-1 (both higher than off-site and with an increasing trend). Fifteen locations were identified as Priority-2 and Priority-3 (higher than off-site or increasing trend). The Priority-2 and Priority-3 locations and parameters are listed in Tables 4-8 and 4-9. It should be noted that beginning in 2008, all trending analyses include data from 2000 forward, rather than the previous five year window. This change makes the trending analyses more meaningful by including all comparable data since 2000. All results are orders of magnitude

below NMED SSLs, levels that would trigger further investigation. All metals were listed as Priority-4 for all sediment samples.

Refer to Figure 4-1 for an illustration of the locations listed in the following descriptions.

### Aluminum

One on-site location (34) and one perimeter location (60) were identified as Priority-2 (higher than off-site) for aluminum in surface soils. These concentrations are well within the range of background identified for aluminum in New Mexico surface soils. All remaining soil and sediment samples were identified as Priority-4 for aluminum.

TABLE 4-7. Various Reference Values for Metals in Soil (all units in mg/kg)

Analyte	NM Soil Concentrations <sup>1</sup>		NMED Soil Screening Levels <sup>2</sup>		US Soil Concentrations <sup>3</sup>	
	Lower Limit	Upper Limit	Residential	Industrial	Lower Limit	Upper Limit
Aluminum	5,000	100,000	74,000	100,000	4,500	100,000
Antimony	0.2	1.3	31	454	0.25	0.6
Arsenic	2.5	19	4	17	1	93
Barium	230	1,800	15,600	100,000	20	1,500
Beryllium	1	2.3	156	2,250	0.04	2.54
Cadmium	ND	11	39	564	0.41	0.57
Calcium	600	320,000	N/A	N/A	N/A	N/A
Chromium	7.6	42	100,000	100,000	7	1,500
Cobalt	2.1	11	1,520	20,500	3	50
Copper	2.1	30	3,130	45,400	3	300
Iron	1,000	100,000	23,500	100,000	5,000	50,000
Lead	7.8	21	400	800	10	70
Magnesium	300	100,000	N/A	N/A	N/A	N/A
Manganese	30	5000	3,590	48,400	20	3,000
Mercury	0.01	0.06	100,000	100,000	0.02	1.5
Nickel	2.8	19	1,560	22,700	5	150
Potassium	1,900	63,000	N/A	N/A	N/A	N/A
Selenium	0.2	0.8	391	5,680	0.1	4
Silica (Silicon)	150,000	440,000	N/A	N/A	24,000	368,000
Silver	0.5	5	3921	5,680	0.2	3.2
Sodium	500	100,000	N/A	N/A	N/A	N/A
Thallium	N/A	N/A	5.6	74.9	0.02	2.8
Titanium	910	4,000	N/A	N/A	20	1,000
Vanadium	15	94	78.2	1,140	0.7	98
Zinc	18	84	23,500	100,000	13	300

NOTES: NMED = New Mexico Environmental Department

N/A = not applicable

ND = not detected

mg/kg = milligram per kilogram

- (1) Dragun and Chekiri, *Elements in North American Soils*, 2005, Hazardous Materials Control Resources Institute, (Used *San Juan Basin, A Horizon* to determine values).
- (2) *Technical Background Document for Development of Soil Screening Levels*, Revision 5.0, New Mexico Environment Department, Hazardous Waste. Bureau and Ground Water Quality Bureau Voluntary Remediation Program, Santa Fe, New Mexico (NMED 2009).
- (3) U.S. Soil Surface Concentrations, Kabata-Pendias, A., CRC, *Trace Elements in Soils and Plants*, 3<sup>rd</sup> Edition, 2000.

**TABLE 4-8.** Summary Statistics for All Locations (2000-2009) Identified as Priority-2 for Metals in Soil During Calendar Year 2009 (all units in mg/kg)

Analyte	Location Type	Location	Average	Std Dev	Minimum	Maximum	NMED Soil Screening Level (Residential)	NMED Soil Screening Level (Industrial)
Aluminum	On-site	34	13,787	4005	8,410	17,700	74,000	100,000
	Perimeter	60	12,037	1,812	8,900	14,200		
Arsenic	On-site	33	12.5	9.3	4.5	32.7	4	17
Beryllium	On-site	33	1.2	0.29	0.79	1.59	156	2,250
		34	0.74	0.13	0.55	0.94		
Chromium	On-site	34	15.3	3.4	8.9	18.8	100,000	100,000
Cobalt	On-site	1	6.3	1.6	4.43	9.4	1,520	20,500
		33	6.02	0.72	5.12	7.14		
		34	6.2	0.69	5.19	7.05		
	Perimeter	60	5.47	0.55	4.74	6.35		
Copper	On-site	1	12.0	3.5	5.7	17.8	3,130	45,400
		34	11.1	1.5	8.7	12.7		
	Perimeter	60	11.1	1.4	9.5	13.0		
Iron	On-site	1	15,386	2,626	11,400	18,500	23,500	100,000
		34	15,847	4,366	9,030	22,700		
Magnesium	On-site	1	4,823	1,183	2,490	6,230	n/a	n/a
		3	5,114	1,208	3,430	6,460		
		34	3,870	465	3,110	4,370		
	Perimeter	60	4,402	390	3,760	4,900		
Nickel	On-site	33	12.6	2.8	8.85	18.1	1,560	22,700
		34	13.4	1.56	10.5	14.9		
Potassium	On-site	1	4,414	1,604	1,020	6,050	n/a	n/a
	Perimeter	60	3,681	360	3,310	4,330		
Zinc	On-site	1	48.7	12.2	23	62	23,500	100,000
		33	58.7	11.8	49	82		

**NOTES:** Std Dev = Standard deviation  
mg/kg = milligram per kilogram  
n/a = not applicable

**TABLE 4-9.** Summary Statistics for All Locations (2000-2009) Identified as Priority-3 for Metals in Soil During Calendar Year 2009 (all units in mg/kg)

Analyte	Location Type	Location	Average	Std Dev	Minimum	Maximum	NMED Soil Screening Level (Residential)	NMED Soil Screening Level (Industrial)
Lead	On-Site	1	11.0	3.6	3.6	15.1	400	800
Potassium	On-Site	2SE	2,090	423	1,520	2,700	n/a	n/a
	Perimeter	11	1282	59.7	1,200	1,380		

**NOTES:** Std Dev = Standard deviation  
mg/kg = milligram per kilogram  
n/a = not applicable

#### Arsenic

One on-site location (33) was identified as Priority-2 (higher than off-site) for arsenic in surface soils. Five of the 43 samples collected exceeded SSLs for industrial/occupational land use. However, all concentrations are well within the range of background identified for arsenic in New Mexico surface soils, and are expected to be naturally occurring. All remaining soil and sediment samples were identified as Priority-4 for arsenic.

#### Beryllium

Two on-site locations (33 and 34) were identified as Priority-2 (higher than off-site) for beryllium in surface soils. The concentration of beryllium at this location was well within the range of background identified for beryllium in New Mexico surface soils, and is expected to be naturally occurring. All remaining soil, sediment and vegetation samples were identified as Priority-4 for beryllium.

#### Chromium

One on-site location (34) was identified as Priority-2 (higher than off-site) for chromium in surface soils. The concentration is well within the range of background for chromium in New Mexico surface soils, and is expected to be naturally occurring. All remaining soil and sediment samples were identified as Priority-4 for chromium.

#### Cobalt

Three on-site locations (1, 33 and 34) and one perimeter location (60) were identified as Priority-2 (higher than off-site) for cobalt in surface soils. The concentrations at all locations are well within the range of background for cobalt in New Mexico surface soils, and are expected to be naturally occurring. All remaining soil and sediment samples were identified as Priority-4 for cobalt.

#### Copper

Two on-site locations (1 and 34) and one perimeter location (60) were identified as Priority-2 (higher than off-site) for copper in surface soils. The results were well within the range of background identified for copper in New Mexico surface soils, and are expected to be naturally occurring. All remaining soil and sediment samples were identified as Priority-4 for copper.

#### Iron

Two on-site locations (1 and 34) were identified as Priority-2 (higher than off-site) for iron in surface soils. The concentrations are well within the range of background for iron in Western U.S. surface soils, and is expected to be naturally occurring. All remaining soil and sediment samples were identified as Priority-4 for iron.

#### Lead

One perimeter location (1) was identified as Priority-3 (increasing trend) for lead in surface soils. The concentration at this location is well within the range of background for lead in New Mexico surface soils, and is expected to be naturally occurring. All remaining soil and sediment samples were identified as Priority-4 for lead.

#### Magnesium

Three on-site locations (1, 3 and 33) and one perimeter location (60) were identified as Priority-2 (higher than off-site) for magnesium in surface soils. These concentrations are well within the range of background identified for magnesium in New Mexico surface soils, and is expected to be naturally occurring. All remaining soil and sediment samples were identified as Priority-4 for magnesium.

#### Nickel

Two on-site locations (33 and 34) were identified as Priority-2 (higher than off-site) for nickel in surface soils. The concentrations at these locations are well within the range of background for nickel in New Mexico surface soils, and are expected to be naturally occurring. All remaining soil and sediment samples were identified as Priority-4 for nickel.

#### Potassium

One on-site location (1) and one perimeter location (60) were identified as Priority-2 (higher than off-site) for potassium in surface soils. One on-site soil location (2SE) and one community location (11) were identified as Priority-3 (increasing trend). These soil concentrations are well within soil concentrations identified in the Western U.S. surface soils concentrations, and are expected to be naturally occurring. All remaining soil and sediment samples were identified as Priority-4 for potassium.



### Zinc

Two on-site locations (1 and 33) were identified as Priority-2 (higher than off-site) for zinc in surface soils. These soil concentrations are well within soil concentrations identified in the Western U.S. soils concentrations; and are expected to be naturally occurring. All remaining soil and sediment samples were identified as Priority-4 for zinc.

## **4.2 Ecological Surveillance**

Biota monitoring began in 1996 as an additional element of environmental monitoring within the Terrestrial Surveillance Program. The objectives of the Ecological Surveillance Program are to:

- Collect ecological resource inventory data to support site activities while preserving ecological resources and to maintain regulatory compliance,
- Collect information on plant and animal species present to further the understanding of ecological resources on-site,
- Collect biota contaminant data on an as needed basis in support of site projects and regulatory compliance,

- Assist SNL/NM organizations in complying with regulations and laws,
- Educate the SNL/NM community regarding ecological resource conservation, and
- Support line organizations with biological surveys in support of site activities.

The biota data collected are consistent with the requirements under DOE Order 450.1A (DOE 2008a). Data are collected on mammal, reptile, amphibian, bird, and plant species that currently inhabit SNL/NM. Data collected include information on presence, abundance, species diversity, and land use patterns. Since no significantly elevated levels of radionuclides or metals were observed in soil or vegetation samples, no contaminant analysis of radionuclides and metals on wildlife were performed in 2009. Table 1-1 in Chapter 1 represents common species identified at KAFB.

These data are primarily utilized to support NEPA documentation and land use decisions. Data also support wildlife communication campaigns to ensure safe work environments and sustainable decision-making strategies.

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# 5.0 Air Quality Compliance & Meteorological Monitoring

Personnel at Sandia National Laboratories, New Mexico (SNL/NM) conduct air quality monitoring and surveillance under the following three programs:

- Clean Air Network (CAN) Program conducts meteorological monitoring (see Section 5.1) and ambient air surveillance (see Section 5.2).
- National Emission Standards for Hazardous Air Pollutants (NESHAP) Program coordinates with facility owners to meet radiological air emission regulations (see Sections 5.3 and 5.4).
- Air Quality Compliance (AQC) Program ensures that all non-radiological air emission sources at SNL/NM (such as generators, boilers, chemical users, and vehicles) meet applicable air quality standards and permitting requirements (see Section 5.5).

## 5.1 Meteorological Monitoring Program

The Meteorological Monitoring Program is part of the CAN program. The main objective of the Meteorological Monitoring Program is to provide site-specific representative data for SNL/NM. Data is used for air dispersion and transport modeling, to support emergency response activities, and to support regulatory permitting and reporting processes. Additional uses of meteorological data include supporting various environmental activities and programs, and providing data to SNL/NM research and development (R&D) projects.

The U.S. Department of Energy (DOE) directives and regulations applicable to the Meteorological Monitoring Program are listed in Chapter 9.

### *Tower and Network Instrumentation*

Sandia Corporation (Sandia) conducts meteorological monitoring through a network of eight meteorological towers located throughout Kirtland Air Force Base

(KAFB). All towers are on or near SNL/NM property, and the network includes:

- Six 10-meter towers,
- One 30-meter tower, and
- One 60-meter tower.

Routine instrument calibrations and weekly tower site visits are performed as part of the Quality Assurance (QA) Program for the monitoring network. The CAN network of meteorological towers and ambient air monitoring locations are shown in Figure 5-1.

### *Meteorological Monitoring Towers*

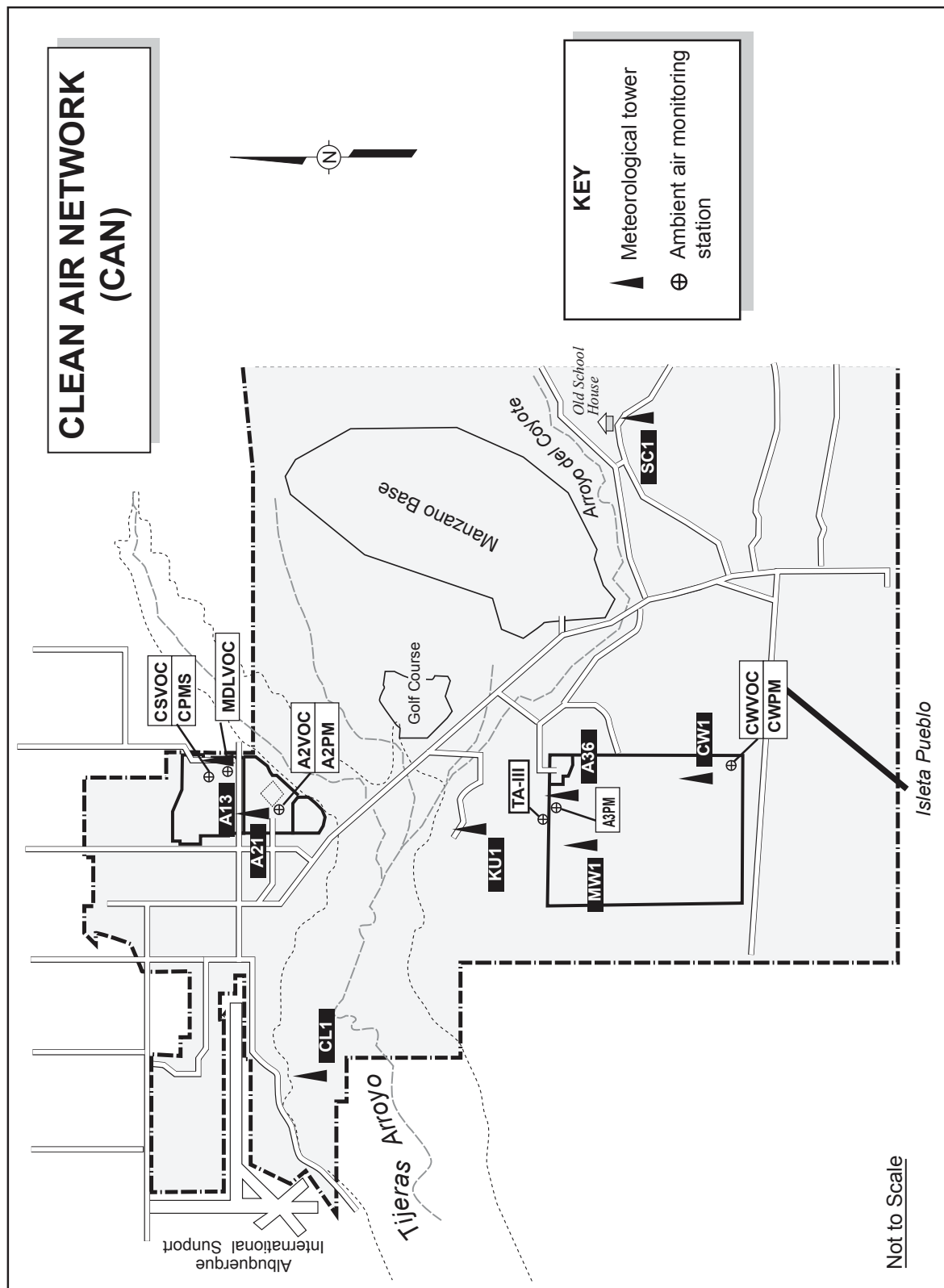
All meteorological towers are instrumented to measure temperature and wind velocity, including the standard deviation of horizontal wind direction (sigma theta), at 3- and 10-meter levels. Temperature and wind velocity are also measured at the top of the two tallest towers (30- and 60-meters).

In addition, relative humidity is measured at the 3-meter level. Rainfall is measured at the 1-meter level at towers A36, A21, and SC1. Barometric pressure is measured at the 2-meter level at towers A36 and A21.

### 5.1.1 Meteorological Monitoring Results

The A36 60-meter tower is used to describe general meteorology at SNL/NM due to its central geographic position and the availability of data at all instrument levels. The 2009 annual climatic summary for tower A36 is shown in Table 5-1.

In general, the annual statistics for each of the towers are similar. However, daily meteorology varies considerably across the meteorological network. This real-time variability of meteorological conditions has implications on the transport and dispersion of pollutants, which are important in atmospheric emergency release scenarios and air dispersion modeling. Figure 5-2 shows some of the variations and extremes found in meteorological measurements across SNL/NM.



02\_5-1.ai

**FIGURE 5-1.** The Clean Air Network (CAN) of Meteorological Towers and Ambient Air Monitoring Stations

**TABLE 5-1. Annual Climatic Summary from Tower A36 – CY 2009**

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
<b>Temperature (°C)</b>													
Average Daily High	10.52	13.89	16.30	19.50	26.62	28.72	32.89	31.20	25.61	18.61	14.03	5.38	20.27
Average Daily Low	-2.30	-0.35	2.27	4.82	12.09	14.99	18.32	16.63	12.68	6.63	1.50	-4.75	6.88
Monthly Mean	4.27	7.10	9.50	12.67	19.57	22.14	25.57	24.39	19.19	12.55	8.52	0.56	13.84
<b>Extremes (°C)</b>													
High	16.01	22.40	23.66	26.57	32.03	32.44	35.96	35.89	31.97	25.37	21.54	12.00	35.96
Low	-8.97	-6.52	-4.93	-3.93	7.34	9.17	13.18	12.19	5.43	-4.32	-5.34	-13.7	-13.7
<b>Relative Humidity (%)</b>													
Monthly	47.22	29.08	35.14	28.14	33.46	33.23	36.00	35.35	45.25	45.62	43.04	57.86	39.11
<b>Precipitation (cm)</b>													
Monthly	0.00	0.03	0.28	0.66	2.26	2.01	2.72	2.90	4.42	4.06	0.15	0.76	20.24
24 Hour Max	0.00	0.03	0.25	0.25	1.37	0.89	0.97	0.97	2.34	1.73	0.10	0.25	2.34
<b>Wind (m/s)</b>													
Monthly	3.15	3.67	4.29	4.70	4.22	4.04	3.80	3.66	3.72	3.67	2.85	3.10	3.74
24 Hour Max	7.21	7.04	7.38	9.92	11.37	6.45	5.81	6.93	8.62	6.75	7.76	9.70	11.37
Maximum Gust	20.06	26.66	25.66	28.54	28.02	23.62	21.26	25.02	25.06	21.10	16.50	23.18	28.54
<b>Barometric</b>													
Pressure (mb)	836.7	834.7	832.1	831.3	833.4	833.2	836.4	836.7	836.9	831.9	836.1	832.4	834.3

**NOTES:** Conversions to English Units:  
 Wind Speed mph = (2.2369) (m/s)  
 m/sec = meters per second

Temperature = °F = (1.8) (°C) + 32  
 cm = centimeter  
 mb = millibar

°C = degree celcius  
 Rainfall. in. = (cm)/2.54

The following website provides current weather information from the SNL/NM CAN meteorological network:

<http://132.175.200.42/>

### 5.1.2 Wind Analysis

Annual wind roses for three locations across SNL/NM are illustrated in Figures 5-3 and 5-4. A wind rose is a graphical representation of wind speed and direction frequency distribution. Wind direction is the true bearing when facing the wind (the direction from which the wind is blowing). As shown in Figure 5-3, wind directions and speeds can vary significantly across SNL/NM. The annual wind frequency distribution for Technical Area (TA)-I, not shown, indicates yet another pattern, with the greatest direction frequency from the east and east-northeast, as winds blow from Tijeras Canyon. The predominant wind direction at most locations is produced by topographic influences that also create nocturnal drainage flows.

## 5.2 Ambient Air Surveillance Program

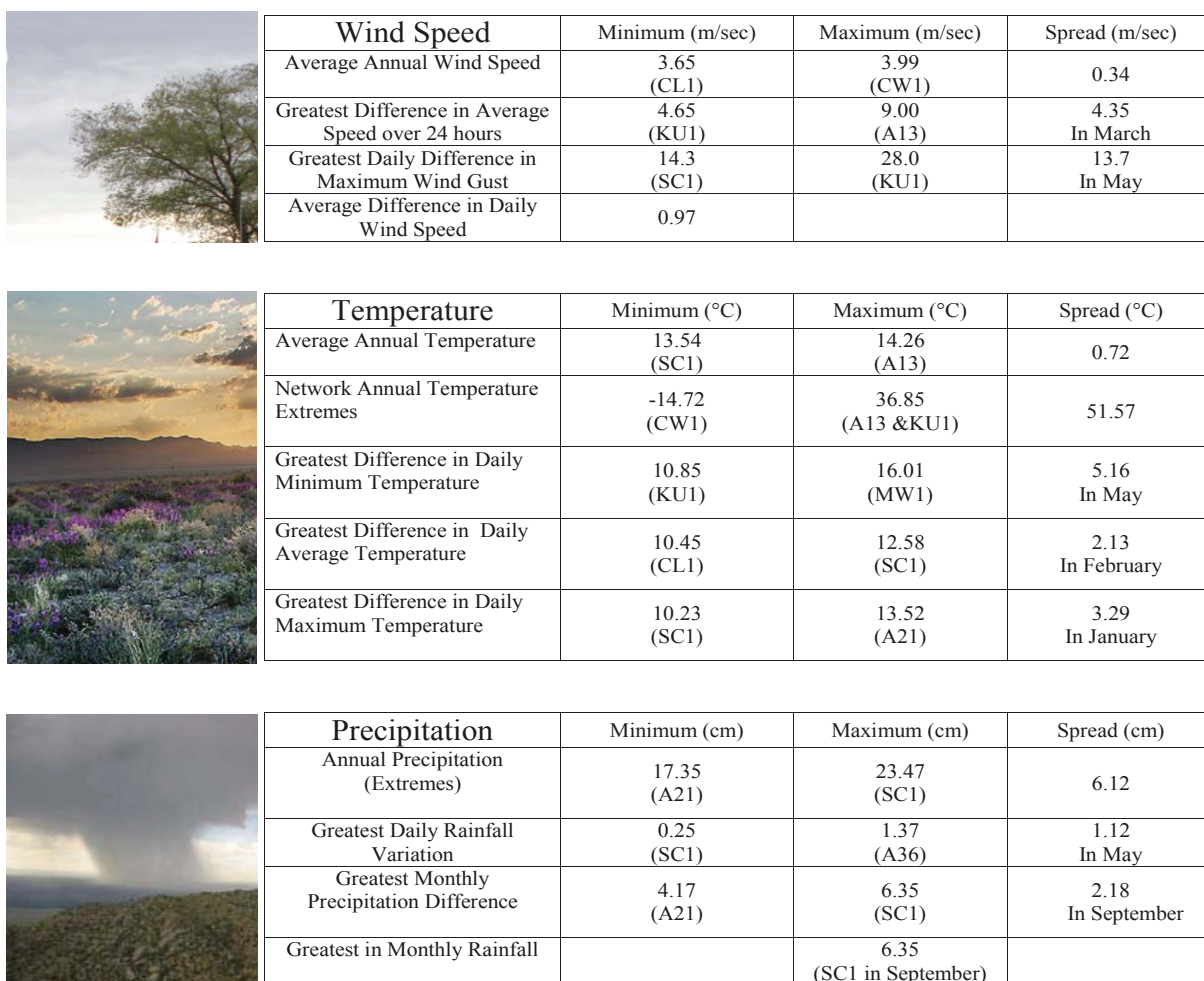
Ambient air surveillance is conducted under the CAN Program through a network of six air monitoring stations located on or near SNL/NM property (see Figure 5-1). The primary objective of the Ambient Air Surveillance Program is to show compliance with the National Ambient Air Quality Standards (NAAQS) (40 Code of Federal Regulations [CFR] 50) and New Mexico Ambient Air Quality Standards (NMAAQs) (20.2.3 New Mexico Administrative Code [NMAC]). Ambient air surveillance is also important to establish background concentration levels for pollutants of concern and to evaluate the effects, if any, from SNL/NM operations on the public and the environment due to operations at SNL/NM. Applicable requirements are listed in Chapter 9.

### 5.2.1 Monitoring Stations

#### **Criteria Pollutant Monitoring Station (CPMS) –**

There is one CPMS in the CAN network. The CPMS is located in the northeast corner of TA-I. Criteria pollutants are the set of six common pollutants for which the U. S. Environmental Protection Agency (EPA) must set national ambient standards according





NOTE: Winter precipitation that falls as snow is underestimated (mostly at the SC1 tower)

**FIGURE 5-2.** Variations and Extremes in Meteorological Measurements Across the Meteorological Tower Network During CY 2009.

to the Clean Air Act (CAA). For more information on air pollutants, visit the following website:

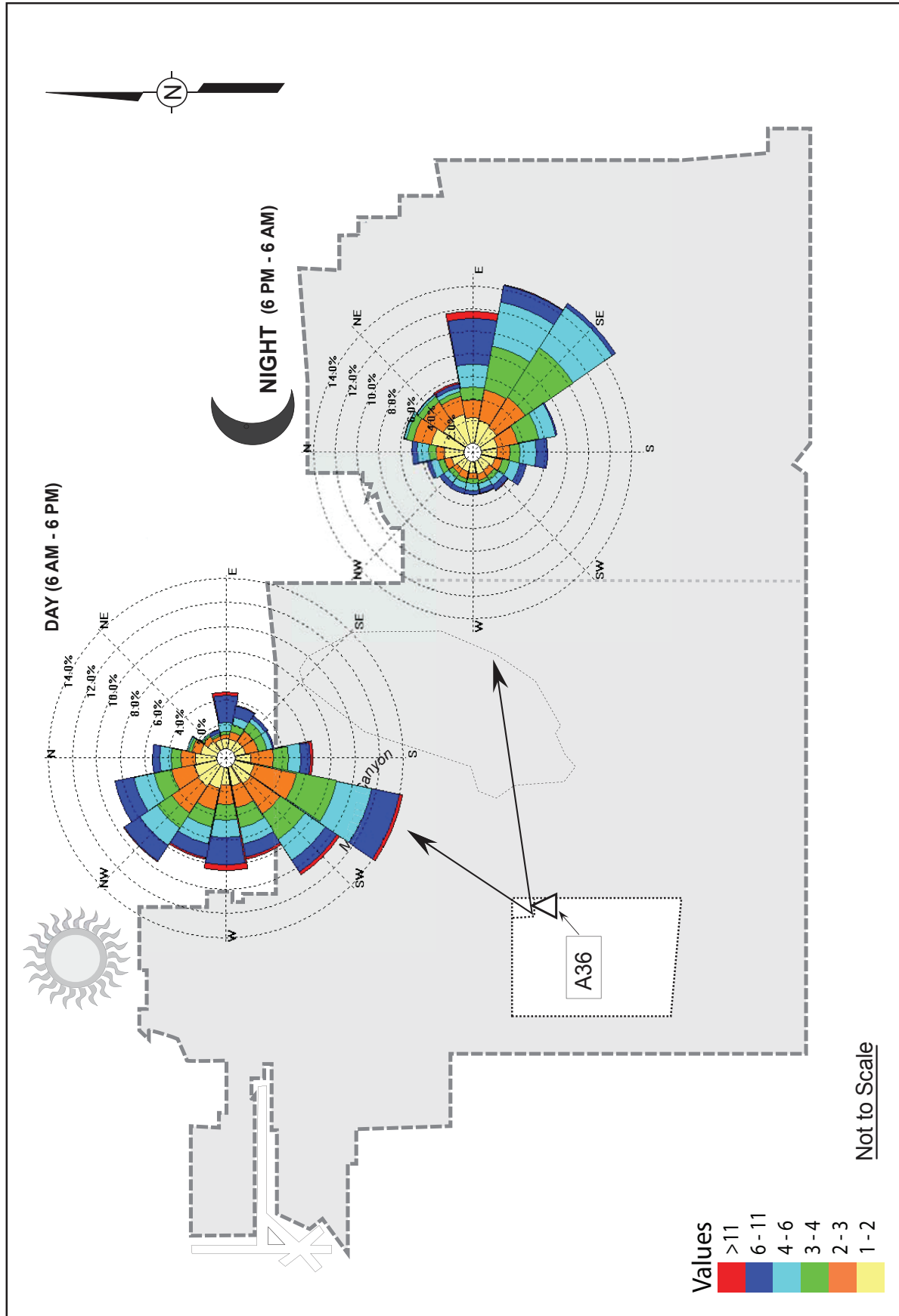
<http://www.epa.gov/ebtpages/air.html>

The CPMS is used to perform continuous monitoring for sulfur dioxide (SO<sub>2</sub>), carbon monoxide (CO), nitrogen oxides (NO<sub>x</sub>), and ozone (O<sub>3</sub>). Data are then compiled into hourly averages. A particulate matter (PM) monitor is a part of the CPMS. Lead (Pb), a criteria pollutant, is one of 23 metals analyzed from PM samples at this station.

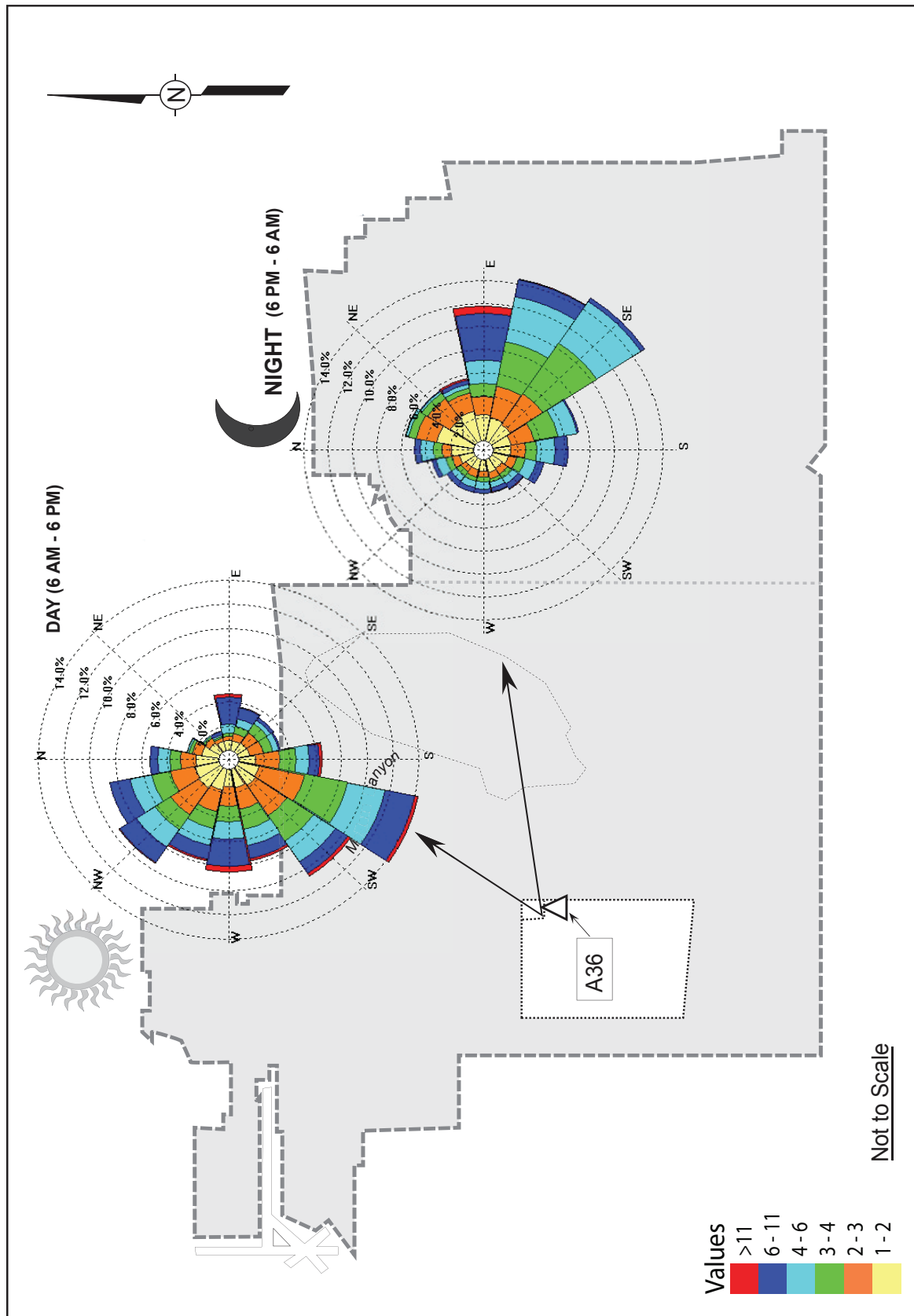
**PM<sub>10</sub> Stations** – PM with a diameter equal to or less than 10 microns are measured at four monitoring locations (CPMS, A2PM, A3PM, and CWPM). Samples are collected over a 24-hour period, starting and ending at midnight, every sixth day. This schedule

is consistent with the National Air Sampling Program (NASP). Samples are analyzed for 23 metals and are radiologically screened using gross alpha, gross beta, and gamma spectroscopy.

**PM<sub>2.5</sub> Stations** – PM with a diameter equal to or less than 2.5 microns is measured at two locations (CPMS and TA-III) at SNL/NM. PM<sub>2.5</sub> is measured continuously and recorded in hourly concentrations 24-hours-a-day, 365-days-per-year. Filters are not manually weighed with this system. The mass is calculated with microprocessor measurements. PM<sub>2.5</sub> and PM<sub>10</sub> measurements at SNL/NM are done with different instruments and should not be quantitatively compared with each other due to differing instrument limitations and processing techniques. PM<sub>2.5</sub> filters are not sent to a laboratory for chemical analysis.



**FIGURE 5-3. 2009 Annual Wind Roses for Towers CL1, A36, and SC1**



**FIGURE 5-4. 2009 Annual Wind Roses for Daytime and Nighttime Wind Frequency at the A36 Tower**

***Volatile Organic Compound (VOC) Stations*** – There are four VOC monitoring stations (CSVOC, MDLVOC, CWVOC, and A2VOC). VOC samples are collected once a month over a 24-hour period.

## **5.2.2 Ambient Air Monitoring Results**

### ***Criteria Pollutants***

The latest EPA standards for criteria pollutants can be found at the following website:

<http://www.epa.gov/air/criteria.html>

In 2009, the automated data recovery for criteria pollutants was approximately 99.8 percent. Table 5-2 lists the results from the CPMS,  $PM_{10}$  and monitors and compares them to NAAQS and NMAAQs for criteria pollutants.

Although violations of annual federal standards for criteria pollutants are not allowed, exceedances for short-term standards are allowable once a year. State standards also allow short-term exceedances due to meteorological conditions for example, in the case of an atmospheric inversion where air mixing may be extremely restricted. There were no exceedances of the criteria pollutant standards in 2009.

### ***$PM_{10}$***

Data recovery for  $PM_{10}$  was 96 percent complete based on a sampling schedule occurring every sixth day. The highest daily particulate loading occurred at the CPMS site. A  $PM_{10}$  concentration of 37 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ) occurred at A2PM in April 2008. The monthly and annual averages for  $PM_{10}$  are listed in Table 5-3 (Table 5-4 shows monthly and annual averages for  $PM_{2.5}$ ). The annual PM concentrations for 2009 are slightly lower, though comparable to the results for 2008.

All filters collected from the  $PM_{10}$  stations that have complete field data are analyzed for 23 metals plus the radiological analyses. Filters are collected every sixth day and are consolidated into monthly composites for analyses. In 2009, monthly composites varied from three to six filters per month, depending on the sampling schedule and sampler power problems. In an attempt to provide better analytical information, results are included in averages only when they are actually higher than the radiological decision levels or instrument detection limits. Table 5-5 lists the

averaged results of the  $PM_{10}$  analysis. It should be noted that most of the radionuclides are naturally occurring, or are short-lived decay daughter products found while the sample was in the counter, and are not emitted from SNL/NM sources. Many of the radionuclide averages in Table 5-5 are based on the results of one or two samples in the year identifying small concentrations of the constituent.

An Analysis of Variance (ANOVA) was performed to determine if statistical differences existed between stations. The results of the ANOVA indicated that the concentrations of thorium-234 and uranium-238 at the A3PM station were statistically different and slightly higher than the other sites. The area surrounding the A3PM station is mostly desert landscape, and these two radionuclide compounds are naturally occurring which could account for their slightly elevated levels. The results of the ANOVA also indicated that the concentration of bismuth-214 was statistically higher at A2PM and A3PM stations. Again, these areas have mostly desert landscape, and the naturally occurring radionuclides could contribute to this. Uranium was also shown to be statistically higher at A2PM, CWPM, and CPMS stations. The area surrounding A2PM and CWPM are desert landscapes, once again with naturally occurring radionuclides. There were several construction projects in the area of CPMS throughout the year, along with the high winds which could increase the dirt around the monitors.

### ***$PM_{2.5}$***

$PM_{2.5}$  is also known as “fine particulate.” Fine particulates are thought to be a greater health hazard than  $PM_{10}$  because the smaller-sized particles can lodge deep in the lungs. Most  $PM_{2.5}$  is created either directly from the combustion of all types of fossil fuels, including wood burning, or by secondary reactions of gases created in the combustion process with other gases in the atmosphere. The data recovery for  $PM_{2.5}$  measurements was approximately 99 percent. The monthly and annual averages for  $PM_{2.5}$  are listed in Table 5-4. In 2009, the highest concentrations were found in the beginning of the summer and were most likely the result of wildland fire smoke transported from areas outside of SNL/NM. Concentrations in the Sandia area dropped quickly with the onset of rains in late June to early July. Concentrations tend to be higher at the CPMS station due to the higher traffic counts in the area.

**TABLE 5-2. Criteria Pollutant Results as Compared to Regulatory Standards – 2009**

Criteria Pollutant	Averaging Time	Unit	NMAAQs Standard	NAAQS Standard	Maximum or Measured Concentrations
Carbon Monoxide	1 hour	ppm	13.1	35	2.1
	8 hours	ppm	8.7	9	1.3
Nitrogen Dioxide	24 hours	ppm	0.10	-	0.03
	Annual	ppm	0.05	0.053	0.01
Sulfur Dioxide <sup>§</sup>	3 hours	ppm	-	0.50	0.01
	24 hours	ppm	0.10	0.14	0.002
	Annual	ppm	0.02	0.03	0.001
Ozone	1 hour	ppm	d	d	0.1
	8 hour	ppm	-	0.075	0.04 <sup>a</sup>
PM <sub>10</sub>	24 hours	µg/m <sup>3</sup>	-	150 <sup>b</sup>	29
	Annual	µg/m <sup>3</sup>	-	50	10.4
PM <sub>2.5</sub>	24 hours	µg/m <sup>3</sup>	-	35	16.1 <sup>c</sup>
	Annual	µg/m <sup>3</sup>	-	15.0	7.2
Lead	Any quarter	µg/m <sup>3</sup>	1.5	1.5	0.001

NOTES: ppm = parts per million

µg/m<sup>3</sup> = micrograms per cubic meter

NMAAQs = New Mexico Ambient Air Quality Standards

NAAQS = National Ambient Air Quality Standards

PM<sub>10</sub> = particulate matter (diameter equal to or less than 10 microns)

PM<sub>2.5</sub> = respirable particulate matter (diameter equal to or less than 2.5 microns)

<sup>§</sup> Standards are defined in µg/m<sup>3</sup> and have been converted to ppm.

<sup>a</sup> Reported as the fourth highest average of the year – per regulatory standards.

<sup>b</sup> Not to be exceeded more than once per year - per updated regulatory standards

<sup>c</sup> Reported as the three year 98<sup>th</sup> percentile value - per regulatory standards

<sup>d</sup> As of June 15, 2005 EPA revoked the 1-hour ozone standard in all areas except the 8-hour ozone non-attainment Early Action Compact (EAC) Areas. Albuquerque, New Mexico is not an EAC Area.

**TABLE 5-3. Monthly and Annual Averages for PM<sub>10</sub> (Air) – 2009**

Sample Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
A2PM	6.67	11.75	10.80	13.00	14.67	13.60	13.60	9.00	6.40	9.00	10.00	11.00	10.79
CPMS	5.00	6.25	7.20	11.60	12.20	13.60	11.40	5.40	6.50	9.20	6.40	8.25	8.58
CWPM	7.50	12.67	10.20	11.40	13.50	13.80	12.60	9.00	6.40	9.40	8.50	12.60	10.63
A3PM	5.50	7.75	6.75	12.20	14.00	17.00	13.20	10.33	24.50	10.20	9.40	6.80	11.47

NOTES: PM<sub>10</sub> = Particulate Matter (diameter equal to or less than 10 microns).



**TABLE 5-4. Monthly and Annual Averages for PM<sub>2.5</sub> (Air) – 2009**

Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
CPMS	5.6	6.5	7.7	8.0	9.2	9.4	9.2	8.2	7.6	6.8	8.0	7.1	7.8
TA-III	5.2	6.2	7.2	7.1	7.5	7.4	7.6	7.6	7.1	5.7	6.5	5.6	6.7

NOTES: PM<sub>2.5</sub> = Particulate Matter (diameter equal to or less than 2.5 microns).

**TABLE 5-5. Averaged Results of PM<sub>10</sub> Analysis (Air) – 2009**

Analyte	Units	A2PM	CPMS	CWPM	A3PM	TLV
Aluminum	µg/m <sup>3</sup>	7.997 E-02	7.215 E-02	6.427 E-02	1.558 E-01	2,000
Antimony	µg/m <sup>3</sup>	1.476 E-04	6.354 E-05	1.068 E-04	8.078 E-05	500
Arsenic	µg/m <sup>3</sup>	1.986 E-04	1.106 E-04	2.144 E-04	4.362 E-04	10
Barium	µg/m <sup>3</sup>	3.191 E-03	2.035 E-03	3.146 E-03	2.626 E-03	50
Cadmium	µg/m <sup>3</sup>	3.571 E-01	2.134 E-01	2.516 E-01	4.969 E-01	10
Calcium	µg/m <sup>3</sup>	5.348 E-04	3.010 E-04	4.441 E-04	5.295 E-04	2,000
Chromium	µg/m <sup>3</sup>	1.572 E-04	2.434 E-04	4.203 E-04	3.235 E-04	10
Cobalt	µg/m <sup>3</sup>	6.648 E-03	6.305 E-03	5.947 E-03	7.487 E-03	20
Copper	µg/m <sup>3</sup>	1.072 E-01	8.134 E-02	9.308 E-02	1.655 E-01	1,000
Iron	µg/m <sup>3</sup>	7.611 E-04	7.122 E-04	7.706 E-04	7.775 E-04	5,000
Lead	µg/m <sup>3</sup>	4.343 E-02	3.395 E-02	3.470 E-02	7.624 E-02	150
Magnesium	µg/m <sup>3</sup>	2.610 E-03	1.978 E-03	2.264 E-03	4.512 E-03	10,000
Manganese	µg/m <sup>3</sup>	1.968 E-04	1.622 E-04	4.491 E-04	2.372 E-04	200
Nickel	µg/m <sup>3</sup>	4.135 E-02	3.644 E-02	3.629 E-02	6.017 E-02	50
Potassium	µg/m <sup>3</sup>	ND	2.876 E-06	1.490 E-04	2.585 E-05	2,000
Selenium	µg/m <sup>3</sup>	4.820 E-05	8.646 E-05	5.613 E-05	3.420 E-05	200
Silver	µg/m <sup>3</sup>	1.615 E-01	8.709 E-02	1.090 E-01	2.480 E-01	10
Sodium	µg/m <sup>3</sup>	ND	2.169 E-04	5.368 E-04	6.607 E-04	5,000
Thallium	µg/m <sup>3</sup>	2.358 E-04	1.986 E-04	2.246 E-04	4.055 E-04	100
Vanadium	µg/m <sup>3</sup>	3.907 E-03	3.519 E-03	4.442 E-03	3.397 E-03	50
Zinc	µg/m <sup>3</sup>	1.043 E-05	3.781 E-06	8.588 E-06	8.927 E-06	10
Uranium	µg/m <sup>3</sup>	7.997 E-02	7.215 E-02	6.427 E-02	1.558 E-01	200
Gross Alpha	pCi/m <sup>3</sup>	6.27 E-03	3.06 E-03	2.12 E-03	2.75 E-02	
Gross Beta	pCi/m <sup>3</sup>	1.99 E-02	1.91 E-02	1.92 E-02	1.91 E-02	
Actinium-228	pCi/m <sup>3</sup>	ND	6.557 E-03	5.093 E-03	2.389 E-03	100
Beryllium-7	pCi/m <sup>3</sup>	1.802 E-01	1.816 E-01	1.427 E-01	1.863 E-01	40,000
Bismuth-212	pCi/m <sup>3</sup>	6.678 E-03	ND	ND	2.832 E-03	700
Bismuth-214	pCi/m <sup>3</sup>	6.311 E-03	2.046 E-03	1.179 E-03	2.119 E-04	2,000
Cesium-137	pCi/m <sup>3</sup>	ND	2.854 E-04	ND	7.041 E-04	400
Cobalt-60	pCi/m <sup>3</sup>	1.090 E-02	9.160 E-04	2.307 E-02	6.778 E-04	80
Lead-212	pCi/m <sup>3</sup>	ND	2.305 E-03	1.688 E-03	1.302 E-03	80
Lead-214	pCi/m <sup>3</sup>	5.926 E-03	1.346 E-03	2.113 E-03	3.635 E-03	2,000
Potassium-40	pCi/m <sup>3</sup>	ND	ND	ND	3.789 E-03	900
Radium-224	pCi/m <sup>3</sup>	5.692 E-03	9.238 E-03	6.444 E-03	1.498 E-03	4
Radium-226	pCi/m <sup>3</sup>	1.887 E-02	6.579 E-03	2.143 E-02	2.368 E-02	1
Radium-228	pCi/m <sup>3</sup>	1.288 E-02	1.892 E-02	7.071 E-03	ND	3
Thorium-234	pCi/m <sup>3</sup>	1.119 E-02	3.949 E-02	ND	ND	400
Uranium-235	pCi/m <sup>3</sup>	7.830 E-03	ND	ND	2.375 E-03	0.1
Uranium-238	pCi/m <sup>3</sup>	1.119 E-02	3.949 E-02	ND	ND	0.1

NOTES: µg/m<sup>3</sup> = micrograms per cubic meter

pCi/m<sup>3</sup> = picocuries per cubic meter

TLV = threshold limit value (TLVs are guidelines and not legal standards. TLV guidelines assist in the control of health hazards) (ACGIH 2009). The TLVs listed for radionuclides are derived from DOE Order 5400.5 derived concentration guide values defined for 100 mrem.

ND = not detected

## VOCs

The VOCs generally observed at SNL/NM are products or by-products of fossil fuels, or from lab operations. In 2009, the data recovery for VOC monitoring was 99 percent. Monthly VOC samples were analyzed for 32 VOC species plus total non-methane hydrocarbon (TNMHC). Table 5-6 shows the compiled results for compounds detected at four stations.

The concentrations in Table 5-6 reveal that there is not one site with the highest concentration for all analytes, though the greatest numbers of contaminants are found at the TA-II VOC site.

An ANOVA was performed to determine if statistical differences existed between locations for each VOC. The ANOVA revealed that there were no statistical significant differences. The samples that were pulled on April 27, 2009 at the TA-II site showed an abnormally high TNMHC for both the routine and the co-located samples. The routine was 9.09 parts

per billion by volume (ppbv) and the co-located sample was 7.6 ppbv. The laboratory was contacted to verify that the canister was properly cleaned prior to the sample being drawn, and that the samples were appropriately handled when being analyzed. There was nothing identified at the laboratory that could have caused the high values. There were various construction projects that happened in the area surrounding the TA-II VOC monitor which would involve an increase in traffic and heavy construction equipment, and the increase in TNMHC is most likely from the burning of fossil fuel in those vehicles.

## 5.3 Radiological Air Emissions

The EPA regulates radionuclide air emissions in accordance with 40 CFR 61, Subpart H, "National Emission Standards for Emissions of Radionuclides Other than Radon from Department of Energy Facilities." The EPA has set a maximally exposed

**TABLE 5-6. VOC Average Concentrations Compiled from Monthly Results at Four Stations (Air) – 2009**  
*Average was computed using only detected results*

Compound	CPMSVOC	CWVOC	MDLVOC	TA-II VOC	TLV
1,1,1-Trichloroethane **	ND	ND	ND	ND	350,000
1,1,2-Trichlorotrifluoroethane **	ND	ND	ND	ND	1,000,000
1-Butene/Isobutene	0.50	0.43	0.22	0.41	NA
2,2,4-Trimethylpentane	ND	ND	ND	0.74	NA
2-Butanone (MEK)	0.67	0.97	0.86	1.19	200,000
2-Methylbutane	1.75	0.63	0.83	25.12	1,770,000
3-Methylpentane	0.14	ND	0.16	2.12	500,000
Acetone	4.65	5.10	4.78	5.80	500,000
Benzene	0.25	0.16	0.23	0.55	500
Carbon tetrachloride **	0.10	0.11	0.11	0.12	5,000
Chloromethane	0.63	0.58	0.55	0.66	50,000
Dichlorodifluoromethane **	0.55	0.52	0.51	0.54	1,000,000
Ethylbenzene	ND	ND	ND	ND	1,000,000
Isohexane	0.14	ND	0.10	2.68	100,000
Isopentane	ND	ND	ND	ND	NA
Methylene chloride	0.27	0.17	3.56	5.34	50,000
n-Butane	0.67	0.47	0.48	0.80	800,000
n-Hexane	0.14	ND	ND	1.55	50,000
n-Pentane	0.78	0.46	0.29	51.19	600,000
o-Xylene	0.11	ND	ND	0.55	100,000
p-Xylene/m-Xylene	0.21	ND	ND	1.84	NA
Tetrachloroethene	ND	ND	ND	0.20	25,000
Toluene	0.77	0.45	0.55	5.74	50,000
Trichloroethene	ND	ND	ND	0.27	50,000
Trichlorofluoromethane **	0.28	0.28	0.28	0.30	1,000,000
TNMHC	19.22	11.77	13.07	59.59	NA

**NOTES:** ppbv = parts per billion by volume

ND = not detected

NA = not available

VOC = volatile organic compounds. VOCs may be shown as separate species as well as in combination with another analyte.

TLV= threshold limit value (TLVs are guidelines and not legal standards. TLV guidelines assist in the control of health hazards) (ACGIH 2009)

\*\* Ozone depleting compounds

individual (MEI) radiological dose limit of 10-millirems per year (mrem/yr) resulting from all radiological air emissions produced from a DOE facility.

### **5.3.1 Compliance Reporting**

Sandia prepares an annual NESHAP report that summarizes radionuclide air emission releases from SNL/NM facilities and presents the results of the annual dose assessment. The DOE National Nuclear Security Administration (NNSA), Sandia Site Office (SSO) submits the annual report to EPA and the City of Albuquerque (COA) Environmental Health Division (EHD). The NESHAP report prepared in 2010 includes the *NESHAP Annual Report for Calendar Year (CY) 2009, SNL/NM* (SNL 2010a).

### **5.3.2 SNL/NM NESHAP Facilities**

Currently, there are 14 potential NESHAP facilities that may be defined as either point or diffuse emissions sources at SNL/NM. Point sources are produced from an exhaust stack or vent, while diffuse sources emanate from broad areas of contamination, such as radionuclide-contaminated soils present at some Environmental Restoration (ER) sites.

Table 5-7 lists the radionuclides and the total reported emissions (in curies [Ci]) from each SNL/NM NESHAP source in 2009. Of the 14 sources, 13 were point sources and one was a diffuse source (a landfill). Four of the 13 facilities reported no emissions in 2009.

The 14 SNL/NM NESHAP facilities are illustrated in Figure 5-5 and are described below.

#### **TA-I Sources**

Radiation Protection Instrument Calibration Laboratory (RPICL) – Calibration on radiation detection equipment resulted in small releases of tritium.

Neutron Generator Facility (NGF) – The NGF is the nation's principal production facility for neutron generators. This facility currently emits only tritium. The facility has two stacks, but only utilizes the main stack in the Tritium Envelope North Wing. In 2009, the NGF emitted 7.03 Ci of tritium, based on continuous stack monitoring. Although anticipated tritium releases do not exceed the regulatory threshold requiring continuous monitoring, it is performed

voluntarily at NGF as a best management practice (BMP).

Process Research Development (PRD) Laboratory – This laboratory is capable of handling and conducting research on tritium materials. It is currently in standby mode, and has yet to become operational; therefore, there were no emissions from this laboratory in CY 2009.

Radiation Laboratory – Small-scale radiation experiments resulted in the release of air trace amounts activation products and tritium.

Radiation Protection Sample Diagnostics (RPSD) Laboratory – Small-scale radiometric sample analyses on an as-needed basis. In 2009 there were no reportable emissions.

Sandia Tomography and Radionuclide Transport (START) Laboratory – This laboratory is used to perform small-scale experiments.

TANDEM Accelerator – This is an ion solid interaction and defect physics accelerator facility. In 2009, the facility reported emissions of tritium.

#### **TA-II Sources**

Explosive Components Facility (ECF) – The ECF conducts destructive testing on neutron generators. In 2009, the facility reported emissions of tritium.

#### **TA-III Sources**

Mixed Waste Landfill (MWL) – The MWL was closed in 1988. Although a diverse inventory of radionuclides is present in the MWL, measurements indicate that tritium is the only radionuclide released into the air. In 1992, 1993, and 2003, special studies were conducted to quantify the tritium emissions (Anderson 2004). The most recent value, from 2003, was used for their annual inventory.

Radioactive and Mixed Waste Management Facility (RMWMF) – The RMWMF primarily handles low-level waste (LLW), mixed waste (MW), and some transuranic (TRU) waste. In 2009, the RMWMF reported tritium releases, americium-241, strontium-90, and cesium-137 as determined by continuous stack monitoring. Although anticipated tritium releases do not exceed the regulatory threshold requiring continuous monitoring, it is performed voluntarily at the RMWMF as a BMP.

**TABLE 5 7.** Summary of Radionuclide Releases from the 14 NESHAP Sources – 2009

Source Name, Location	Description	Source Type	Monitoring Method	Radionuclide Emitted	Reported Release (Ci/yr)
ACRR, TA-V	Reactor used to perform in-pile experiments for severe reactor accident research projects.	Point	Periodic	<sup>41</sup> Ar	4.51
HCF, TA-V	Facility provides full capability to handle and analyze radioactive material.	Point	Periodic	N/A	N/A
ECF, TA-II	Facility used for testing neutron generator design and manufacturing.	Point	Calculation	<sup>3</sup> H	9.2 E-04
HERMES-III, TA-IV	Gamma simulator used primarily for simulating the effects of prompt radiation from a nuclear burst on electronics and complete military systems.	Point	Periodic	<sup>13</sup> N <sup>15</sup> O	7.6 E-04 7.6 E-05
MWL, TA III	Environmental restoration site that acts as a diffuse source of tritium emissions into the atmosphere.	Diffuse	Periodic	<sup>3</sup> H	9.0 E-02
NGF, TA-I	Principal production facility for neutron generators – Tritium Envelope North Wing.	Point	Continuous	<sup>3</sup> H	7.03
PRD Laboratory, TA-I	Research and Development on tritium.	Point	Calculation	N/A	N/A
Radiation Laboratory, TA-I	Laboratory that performs small-scale experiments.	Point	Calculation	<sup>3</sup> H <sup>13</sup> N <sup>16</sup> N <sup>41</sup> Ar	1.0 E-05 1.0 E-06 2.0 E-07 1.0 E-09
RMWMF, TA-III	Facility that handles radioactive and mixed waste products.	Point	Continuous	<sup>3</sup> H (oxide) <sup>3</sup> H (elemental) <sup>241</sup> Am <sup>90</sup> Sr <sup>137</sup> Cs	2.08 E+00 2.55 E-01 1.73 E-05 3.84 E-07 1.01 E-07
RPICL, TA-I	Laboratory that performs radiation detection equipment calibration.	Point	Calculation	<sup>3</sup> H	2.3 E-05
RPSD TA-II	Small-scale laboratory analyses, as needed.	Point	Calculation	N/A	N/A
START, TA-I	Small-scale laboratory operation.	Point	Calculation	<sup>239</sup> Pu <sup>238</sup> U	8.66 E-07 1.10 E-08
Tandem Accelerator, TA-I	Ion solid interaction and defect physics accelerator facility.	Point	Calculation	N/A	N/A
Z Facility, TA-IV	Experimental facility for research on light-ion inertial confinement fusion. Technology involves storing large amounts of electrical energy over a period of minutes and then releasing this energy in an intense, concentrated burst at a target.	Point	Calculation	<sup>3</sup> H	9.02 E-04

**NOTES:** \*Monitoring Method: Periodic = Based on periodic measurements  
Calculation = Calculated from known parameters  
Continuous = Based on continuous air monitoring results

ACRR = Annular Core Research Reactor

N/A = not available

Ci/yr = curies per year

NGF = Neutron Generator Facility

ECF = Explosive Components Facility

PRD = Process Research Development

RMWMF = Radioactive and Mixed Waste Management Facility

RPICL = Radiation Protection Instrument Electron Calibration Laboratory

MTSLL = Metal Tritide Shelf-Life Laboratory

HERMES-III = High Energy Radiation Megavolt Source-III

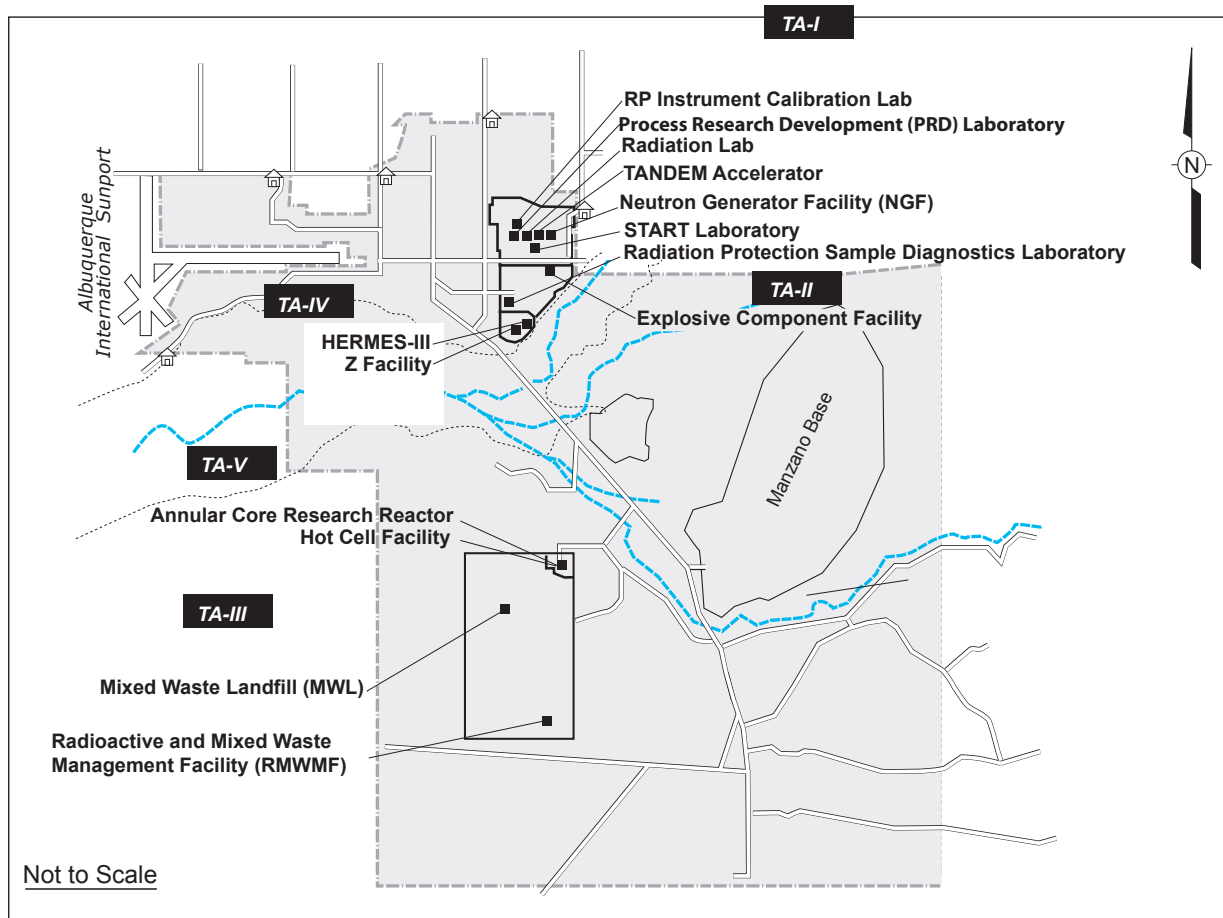
RPSD = Radiation Protection Sample Diagnostics

MWL = Mixed Waste Landfill

START = Sandia Tomography and Radionuclide Transport Laboratory

HCF = Hot Cell Facility

TA = Technical Area



**FIGURE 5-5.** Locations of the 14 Facilities at SNL/NM that Provided Radionuclide Release Inventories in 2009

#### ***TA-IV Sources***

High-Energy Radiation Megavolt Electron Source - III (HERMES-III) – The HERMES-III accelerator is used to test the effects of prompt radiation on electronics and complete military systems. This facility produces air activation products, primarily nitrogen-13 and oxygen-15. In 2009, the facility reported releases of nitrogen-13 and oxygen-15.

Z Facility – The Z Facility is an accelerator used for research on light ion inertial confinement fusion. Large amounts of electrical energy are stored over several minutes and then released as an intense concentrated burst (shot) at a target.

#### ***TA-V Sources***

Annular Core Research Reactor (ACRR) – This reactor is used primarily to support defense program projects. If required in the future, the facility also has the capability to support the Medical Isotope Production Project (MIPP). Argon-41, an air activation product, was the only reported release in 2009.

Hot Cell Facility (HCF) – The HCF provides full capability to remotely handle and analyze radioactive materials such as irradiated targets. In 2009 there were no reportable emissions. In 2009 the stack for the HCF was removed. There is no future anticipated use for the HCF and will be removed as a source next reporting year.

### **5.4 Assessment of Potential Dose to the Public**

In general, the dose received by a person is dependent on the distance from the source, the available pathways in the environment (food chain, air, and water), radionuclide quantities and properties, and meteorological conditions. Historically, radioactive releases from SNL/NM have resulted in doses to the public that are several orders of magnitude below the EPA's standard of 10 mrem/yr. Radiation protection standards specific to DOE facilities are provided in Chapter 9.



### 5.4.1 NESHAP Dose Assessment

#### Emission Sources

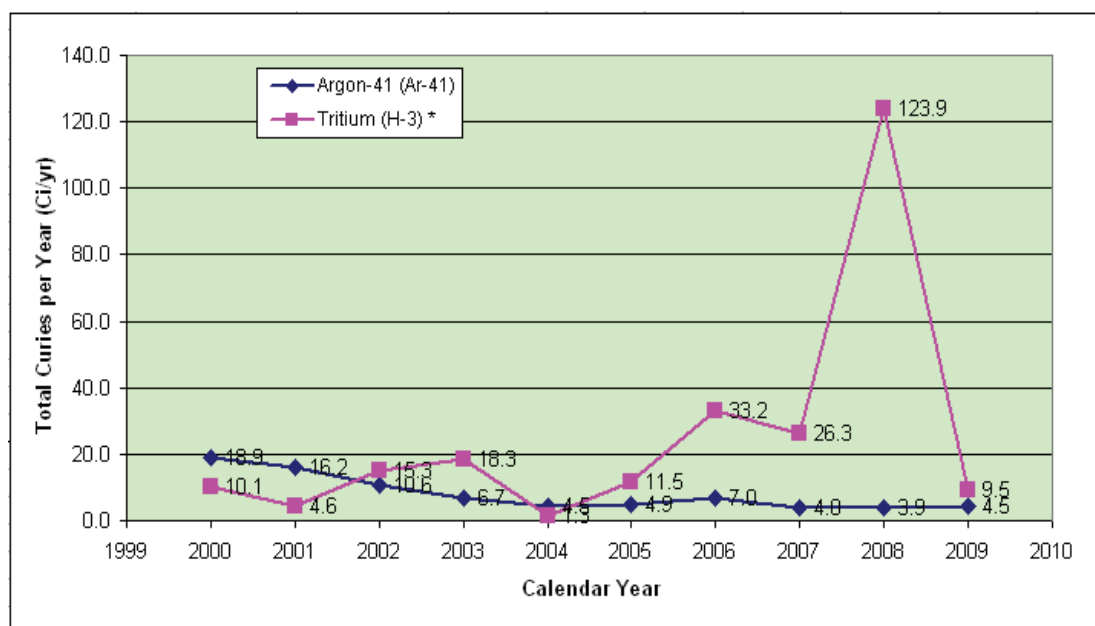
To assess compliance, all NESHAP facilities at SNL/NM must submit annual facility emission data to the NESHAP Team Leader. The emissions from six “primary” sources (ACRR, HCF, Z Facility, NGF, RMWMF, and MWL) are modeled using EPA’s CAA Assessment Package-1988 (CAP88) (EPA 2006) to estimate the annual dose to each of 36 identified public receptors. Primary sources are those that determine their emissions by direct measurements or by calculations based on measured operational parameters. The HCF, was the only primary source that reported no emissions for 2009. Currently the HCF is not in operation.

The NESHAP regulation requires DOE to continuously monitor any radionuclide air emission source that has the potential to produce a dose of 0.1 mrem/yr to the MEI; however, there are no facilities at SNL/NM that exceed this criterion. As a BMP, some SNL/NM facilities perform continuous stack monitoring. Other facilities base their emission estimates on periodic confirmatory measurements or engineering calculations. In 2009, the highest emissions were from tritium. Historically, tritium and argon-41 have

been the most significant contributor to the effective dose equivalent (EDE) of the MEI. Figure 5-6 shows the annual reported release (in Ci) of tritium and argon-41 over the past 19 years. The atmosphere contains 72 percent nitrogen, 21 percent oxygen, 0.93 percent argon, 0.03 percent carbon dioxide, and minor concentrations of neon, methane, hydrogen, helium, and krypton. Some of these constituents are susceptible to isotope transformations during high energy processes, which result in air activation products such as argon-41.

#### Demographic Data

Demographic data includes the resident population, the number of beef and dairy cattle, and the utilized food crop area fraction for a 50-mile (mi) radius study area. The densities for resident population, cattle, and food crops are calculated as the quotient of the most recent county data and the county land area (e.g., cows per acre). In 2009 the NESHAP calculation for resident population was based on the State’s 2000 to 2001 estimated urban and county population data and U.S. Census Bureau data (DOC 2010). The beef and dairy cattle numbers and food crop area fraction were calculated using 1998 agricultural statistics. The statistics were supplied by the New Mexico Department of Agriculture (NMDOA)



\* The spike in tritium in 2008 was due to coincidental increased operations at the NSF and the RMWMF.

**FIGURE 5-6.** Summary of Atmospheric Releases of Ar-41 and H-3 from SNL/NM Facilities from 2000 through 2009. (Emissions vary from year to year based on the operations conducted at the various facilities.)

(NMDOA 2009). The following values were used in the 2009 CAP88 calculation:

- 1.927 Dairy cattle/km<sup>2</sup>
- 1.156 Beef cattle/km<sup>2</sup>
- 8.1 E-04 Acres of food crops/m<sup>2</sup>
- 793,740 Population (within 50-mi radius)
- 

#### ***On-Site and Off-site Public Receptors***

A total of 36 receptor locations in the vicinity of SNL/NM have been identified as potential locations of maximum exposure to a member of the public. Off-site receptor locations extend to the Isleta Pueblo Indian Reservation, the Four Hills subdivision north of KAFB, the Manzanita Mountains (with east mountain residents), and areas near the Albuquerque International Sunport (AIS) west of KAFB. On-site receptors include U.S. Air Force (USAF) facilities, offices, and housing areas, as well as other non-DOE and non-U.S. Department of Defense (DoD) facilities on KAFB.

#### ***Meteorology***

Data from four meteorological towers (CW1, A36, A21, and MW1) in the proximity of NESHAP emission sources were used in 2009. Data from each tower consisted of approximately 35,000 hourly observations of wind direction, wind speed, and

stability class (inferred from wind and solar insulation data). The data are compiled into a normalized distribution from which all wind and stability frequency-of-occurrence data were derived.

### **5.4.2 Dose Assessment Results**

CAP88 utilizes a Gaussian plume equation that estimates air dispersion in both horizontal and vertical directions. Individual EDEs to off-site and on-site receptors are presented in Tables 5-8 and 5-9, respectively. Dose assessment results are summarized in Table 5-10.

The total dose at each receptor location is determined by summing the individual doses resulting from each source. The dose to the MEI member of the public is then compared to the EPA limit of 10 mrem/yr.

In 2009, the on-site MEI was located on KAFB at the Honeywell Systems Support Site. The MEI dose of 1.05 E-03 mrem/yr at the Honeywell Systems Support Site resulted primarily from releases of tritium from the nearby NGF. The off-site MEI was located at the Eubank Gate Area. The MEI dose from primarily tritium releases at the nearby NGF in TA-I was 4.76 E-04 mrem/yr.

**TABLE 5-8.** Annual Source-Specific Effective Dose Equivalent (EDE) from Primary Sources to Off-site Receptors – 2009

Facility	ACRR Emission (mrem/yr)	MWL Emission (mrem/yr)	NGF Emission (mrem/yr)	RMWMF Emission (mrem/yr)	Z Facility Emission (mrem/yr)	TOTAL from Primary Sources (mrem/yr)
Albuquerque City Offices	1.50 E-05	7.00 E-07	1.50 E-04	2.40 E-05	1.20 E-08	1.90 E-04
East Resident	1.00 E-05	6.80 E-07	1.50 E-04	2.00 E-05	1.20 E-08	1.81 E-04
Eubank Gate Area (Bldg. 8895)	9.00 E-05	9.70 E-07	3.00 E-04	4.90 E-05	2.20 E-08	4.40 E-04
Four Hills Resident	1.40 E-05	6.80 E-07	1.50 E-04	1.90 E-05	1.20 E-08	1.84 E-04
Isleta	1.40 E-05	6.90 E-07	1.50 E-04	2.20 E-05	1.20 E-08	1.87 E-04
La Luz Childcare	4.90 E-05	7.60 E-07	1.60 E-04	3.80 E-05	1.30 E-08	2.48 E-04
Manzano Mesa Apartments	1.80 E-05	7.20 E-07	1.50 E-04	2.30 E-05	1.20 E-08	1.92 E-04
Tijeras Arroyo (West)	1.60 E-05	7.00 E-07	1.50 E-04	2.40 E-05	1.20 E-08	1.91 E-04
USGS	4.50 E-05	7.70 E-07	1.50 E-04	4.30 E-05	1.20 E-08	2.39 E-04
VA Hospital	2.90 E-05	7.80 E-07	1.50 E-04	3.20 E-05	1.30 E-08	2.12 E-04
Willow Wood	2.30 E-05	7.20 E-07	1.50 E-04	2.60 E-05	1.30 E-08	2.00 E-04
<b>TOTAL</b>	<b>3.23 E-04</b>	<b>8.17 E-06</b>	<b>1.81 E-03</b>	<b>3.20 E-04</b>	<b>1.45 E-07</b>	<b>2.46 E-03</b>

**NOTES:** mrem/yr = millirem per year  
ACRR = Annular Core Research Reactor  
MWL = Mixed Waste Landfill  
NGF = Neutron Generator Facility  
RMWMF = Radioactive Mixed Waste Management Facility  
\*Only major sources are presented in this table which total to 2.46 E-03.

**TABLE 5-9. Annual Source-Specific Effective Dose Equivalent (EDE) to On-site Receptors – 2009**

Facility	ACRR	MWL	NGF	RMWMF	Z Facility	TOTAL
	Emission (mrem/yr)	Emission (mrem/yr)	Emission (mrem/yr)	Emission (mrem/yr)	Emission (mrem/yr)	
Airport Bldg. 761	1.70 E-04	3.30 E-07	7.70 E-05	4.60 E-05	1.10 E-08	2.93 E-04
Air National Guard Communications Flight	9.60 E-05	2.70 E-07	6.80 E-05	3.90 E-05	8.40 E-09	2.03 E-04
Bernalillo County Sheriff Training	1.90 E-04	3.50 E-07	1.30 E-05	7.20 E-05	2.10 E-09	2.75 E-04
Chestnut Site	2.30 E-04	6.10 E-07	7.50 E-06	6.10 E-04	1.40 E-09	8.48 E-04
Child Development Center	2.10 E-05	7.20 E-08	3.90 E-06	1.10 E-05	5.80 E-10	3.60 E-05
Golf Course Club House	4.80 E-04	6.90 E-07	2.20 E-05	8.10 E-05	7.50 E-09	5.84 E-04
Golf Course Maintenance Area	2.70 E-04	5.30 E-07	3.10 E-05	6.60 E-05	9.50 E-09	3.68 E-04
Homeland Security Bldg (1008)	1.10 E-04	3.10 E-07	2.40 E-04	4.00 E-05	2.90 E-08	3.90 E-04
Honeywell Systems/Support Site	1.00 E-04	2.80 E-07	3.70 E-04	3.70 E-05	2.10 E-08	5.07 E-04
ITRI/Lovelace	8.90 E-05	1.50 E-07	5.40 E-06	6.40 E-05	9.60 E-10	1.59 E-04
KAFB Fire Station	9.70 E-05	2.40 E-07	1.30 E-04	3.20 E-05	1.10 E-08	2.59 E-04
KAFB Landfill	5.90 E-05	1.40 E-07	8.30 E-06	3.00 E-05	1.40 E-09	9.74 E-05
KAFB New Building (across from TA-IV)	1.60 E-04	3.90 E-07	5.10 E-05	4.70 E-05	5.70 E-08	2.58 E-04
Kirtland Elementary	2.00 E-05	6.80 E-08	3.70 E-06	1.10 E-05	5.40 E-10	3.48 E-05
Kirtland Storage Site	8.60 E-04	1.50 E-06	2.20 E-05	9.80 E-05	6.60 E-09	9.82 E-04
Manzano Offices (Fire Station)	1.90 E-04	3.70 E-07	1.30 E-05	7.70 E-05	2.00 E-09	2.80 E-04
Maxwell Housing (SE Corner)	2.10 E-05	7.30 E-08	4.00 E-06	1.10 E-05	5.90 E-10	3.61 E-05
Kirtland Family	7.50 E-05	2.00 E-07	7.40 E-05	2.90 E-05	5.20 E-09	1.78 E-04
Pershing Park Housing	7.80 E-05	1.90 E-07	5.90 E-05	2.80 E-05	6.20 E-09	1.65 E-04
Riding Club	4.30 E-04	6.00 E-07	1.60 E-05	1.10 E-04	2.90 E-09	5.57 E-04
Sandia Area Federal/Credit Union	1.10 E-04	2.70 E-07	2.50 E-04	3.60 E-05	1.60 E-08	3.96 E-04
Sandia Elementary School	7.30 E-05	2.00 E-07	8.40 E-05	2.90 E-05	7.40 E-09	1.86 E-04
TA-IV Cafeteria	1.50 E-04	4.10 E-07	5.40 E-05	4.90 E-05	9.80 E-08	2.54 E-04
Vehicle Maintenance Flight	9.60 E-05	2.70 E-07	6.30 E-05	3.90 E-05	8.50 E-09	1.98 E-04
Wherry Elementary	4.20 E-05	1.50 E-07	8.80 E-06	2.40 E-05	1.30 E-09	7.50 E-05
<b>TOTAL</b>	<b>4.35 E-03</b>	<b>8.99 E-06</b>	<b>1.81 E-03</b>	<b>1.77 E-03</b>	<b>3.30 E-07</b>	<b>7.94 E-03</b>

**NOTES:** ACRR = Annular Core Research Reactor  
 RMWMF = Radioactive Mixed Waste Management Facility  
 mrem/yr = millirem per year  
 ANG = Air National Guard

MWL = Mixed Waste Landfill  
 NGF = Neutron Generator Facility  
 LRRI = Lovelace Respiratory Research Institute  
 KAFB = Kirtland Air Force Base

**TABLE 5-10. Calculated Dose Assessment Results for On-site and Off-site Receptors and for Collective Populations – 2009**

Dose to Receptor	Location	2009 Calculated Dose	NESHAP Standard
<b>Individual Dose</b>			
On-site Receptor EDE to the MEI	Honeywell Systems Support Site	1.05 E-03 mrem/year (1.05 E-05 mSv/yr)	10 mrem/yr (0.1 mSv/yr)
Off-site Receptor EDE to the MEI	Eubank Gate Area	4.76 E-04 mrem/yr (4.76 E-06 mSv/yr)	10 mrem/yr (0.1 mSv/yr)
<b>Collective Dose</b>			
Collective Regional Population	Residents within an 80-km (50 mi) radius	6.34 E-02 mrem/yr (6.34 E-04 mSv/yr)	No Standard Available
Collective KAFB Population	KAFB Housing	7.62 E-04 mrem/yr (7.62 E-06 mSv/yr)	No Standard Available

**NOTES:** <sup>1</sup> Based on a population of 793,740 people estimated to be living within an 80-km (50-mi) radius.  
<sup>2</sup> Based on a population of 4,021 people estimated to be living in permanent on-base housing.  
 NESHAP = National Emissions Standards for Hazardous Air Pollutants  
 mSv/yr = millisievert per year EDE = effective dose equivalent  
 person-Sv/yr = person-sievert per year MEI = maximally exposed individual  
 mrem/yr = millirem per year KAFB = Kirtland Air Force Base

By comparison, the average person in the Albuquerque area receives 330 to 530 mrem/yr resulting primarily from radon emanating from earth materials, medical procedures, consumer products, and cosmic radiation (Brookins 1992).

### ***Collective Dose***

The collective population dose resulting from all SNL/NM radiological emissions was calculated for both KAFB and the regional area (Table 5-10). Collective dose calculations are not required by NESHAP regulations; however, it provides a useful numerical comparison of the public dose from year to year. Collective dose is calculated by multiplying a representative individual dose within a population, by the total population. Sandia calculates the collective population dose for both the KAFB housing areas and the general Albuquerque area population within an 80-kilometer km (50-mi) radius.

### ***Regional***

The Albuquerque regional collective population dose in 2009 was 6.34 E-02 person-mrem/yr. This is comparable with the average over the past five years of regional collective population dose data. For the purpose of calculating the collective dose, all releases are assumed to occur from a location centered in TA-V. The population dose was calculated by multiplying 793,740 residents by doses per sector.

### ***KAFB***

A collective population dose for KAFB residents was calculated based on three main housing areas (Maxwell, Pershing Park, and Kirtland Family). Housing demolition and new housing construction at KAFB resulted in fewer residential structures during 2009. However, the overall population increased as additional new housing was completed. The total population dose for KAFB was obtained by summing the three areas based upon a total residential population of 4,285, which is a 7 percent increase over the previous year's population. The CY 2009 calculation resulted in an estimated population dose of 7.62 E-04 person-mrem/yr.

## **5.5 Air Compliance Requirements & Compliance Strategies**

Air quality standards are implemented by regulations promulgated by local and federal governments in accordance with the CAA and the CAA Amendments

(CAAA) of 1990. The Albuquerque Bernalillo County Air Quality Control Board (ABC/AQCB), the State of New Mexico, and the EPA determine applicable air quality standards for non-radiological pollutants. Radionuclide air emissions are currently regulated by the EPA under NESHAP, as discussed in Section 5.4.1. A complete list of air quality regulations applicable to SNL/NM is provided in Chapter 9.

### **5.5.1 SNL/NM Air Emission Sources**

As discussed in Section 5.2.1, criteria pollutants include SO<sub>2</sub>, NO<sub>2</sub>, CO, O<sub>3</sub>, PM, and Pb. For these criteria and other pollutants, the EPA:

- Sets ambient air quality standards – including those for motor vehicle emissions,
- Requires state implementation plans for protection and improvement of air quality,
- Institutes air quality programs to prevent the nation's air from deteriorating, and
- Establishes hazardous air pollutant (HAP) control programs.

EPA standards for criteria pollutants are given in 40 CFR 50, NAAQS and implemented in (20.11.8 NMAC). NMAAQs with criteria pollutant standards for ambient air is met through on-going applicability determinations on potential criteria pollutant emission sources that require the following: acquisition of the necessary permits and registrations for applicable sources from the appropriate regulatory agencies; fuel throughput tracking, monitoring, and reporting; ambient air surveillance; and periodic direct emission sampling. As discussed previously, ambient air measurements taken in the vicinity of SNL/NM facilities have been well below maximum threshold limit values (TLV) and standards for criteria pollutants.

The significant sources of criteria pollutants at SNL/NM are defined as sources that require a permit or registration from a regulatory agency.

A majority of the permits and registrations held by SNL/NM are multi-source (including a combination of criteria pollutant emission sources). Significant sources at SNL/NM are listed, below.

### ***Boilers***

During CY 2009, SNL/NM maintained eight permits and registrations for applicable boilers site wide.

Table 5-11 illustrates the annual fuel usage and associated emissions for CY 2009. The boilers associated with the permits and registrations are shown in Table 5-12.

During CY 2009, Phase Three of the Heating System Modernization (HSM) project was completed which included the installation and startup of 25 of the 123 boilers. Phase One completed 53 boilers and Phase Two completed 33 boilers. The total number of boilers to be installed for the HSM project has been decreased from the original 123 to 111.

The substituted boilers in Permit #1705-M2, which were installed in support of the HSM boiler transition, have been decommissioned as of May 9, 2009. Permit #1705-M2 has been terminated and the Steam Plant will be demolished during the spring of 2010.

#### ***Emergency Generators***

During CY 2009, SNL/NM maintained 11 permits and registrations for applicable generators site wide. The generator in Permit #1705-M1 was decommissioned in May 2008. Table 5-13 illustrates the annual hours of operation and associated emissions for CY 2009. The generators associated with the permits and registrations are shown in Table 5-14.

#### ***Chemical Usage***

During CY 2009, SNL/NM maintained ten permits and registrations for applicable HAPs chemical usage site wide. The HAP chemical usage associated with the permits and registrations is for general laboratory usage for R&D purposes. Table 5-15 illustrates the amount of chemicals purchased at the associated facility for CY 2009. The facilities that have permits or registrations for chemical usages are listed in Table 5-16.

#### ***Miscellaneous New Source Review (NSR) Permits***

The document disintegrator is an industrial-size, classified document shredder. There is one pollutant of concern with this permit, which is particulate emissions. The document disintegrator operated 833 hours in CY 2009 which calculated an estimated 5.0 tons of total suspended particulate (TSP). The process input rate of material was 62.5% below the permitted limit.

Thermal Test Complex (TTC) is an enclosed R&D fire test complex and an important element in the revitalization of SNL/NM test capabilities needed for test article qualification, development, surveillance,

investigation, and modeling. Table 5-17 illustrates the reportable emissions associated with the TTC for CY 2009.

#### ***Open Burn Permits***

Open burn permits are required for:

- Disposal of Explosives by Burning (avoids the hazards of transport and handling),
- Aboveground Detonation of Explosives (over 20 lb),
- Burning Liquid Fuel (2,000 gallons or more, or solid fuel of 5,000 lb in a single event, R&D activity), and
- Igniting Rocket Motors (with greater than 4,000 lb of fuel).

A list of 2009 permits can be found in Chapter 9, Table 9-1.

#### ***Fugitive Dust***

As required by 20.11.20 NMAC, Fugitive Dust Control, DOE obtains fugitive dust permits for each of Sandia's applicable projects that will disturb greater than  $\frac{3}{4}$  acre of soil. For a list of 2009 permits refer to Chapter 9, Table 9-1 of this report.

#### ***Vehicles***

The majority of government vehicles at SNL/NM are owned and managed by the General Services Administration (GSA). All GSA vehicles must comply with the same emission standards set for all personal and non-personal vehicles that are issued KAFB vehicle passes. As required by 20.11.100 NMAC, *Motor Vehicle Inspection Decentralized*, Sandia submits an annual vehicle inventory update and inspection plan to the COA for the applicable SNL/NM owned vehicles.

### **5.5.2 Title V**

The CAAA of 1990 contained provisions under Title V requiring all existing major air emission sources to obtain an operating permit. A major source is defined as the combined emissions from any facility with the potential to emit:

- 100 tons per year (tpy) or greater of any criteria pollutant,
- 10 tpy of any single HAP, and
- 25 tpy of any combination of HAPs.



**TABLE 5-11. Boiler Usage and Emission Data - 2009**

Permit #	Fuel Usage	Emissions (tpy)				
		NO <sub>x</sub>	CO	PM <sub>10</sub>	SO <sub>2</sub>	VOC
R#936-M1	15,513,436 scf	0.78	0.65	0.06	0.01	0.04
R#1406-M1	3,832,609 scf	9.6 E-02	1.6 E-01	1.5 E-02	1.1 E-03	1.1 E-02
#1705-M2	20,440 scf	1.0 E-03	8.6 E-04	7.8 E-05	1.8 E-05	5.6 E-05
	0 gallons	0	0	0	0	0
#1725	10,572,963 scf	0.53	0.44	0.04	0.003	0.03
#1820	31,481,500 scf	0.79	1.32	0.12	0.03	0.09
R#1823	9,984,686 scf	0.50	0.42	0.04	0.003	0.03
#1830	150,661,389 scf	3.8	6.3	0.6	0.1	0.4

**NOTES:** tpy = tons per year  
scf = standard cubic feet

**TABLE 5-12. Boilers Associated with Permits and Registrations - 2009**

Permit	Description	Size	Fuel Type
R#547	Explosives Components Facility (ECF) Boilers used to heat the facility.	Two (2) 4.3437 MMBtu	Natural Gas
R#936-M1	Processing and Environmental Technology Laboratory (PETL) Boilers used to heat the facility.	Ten (10) 1.4 MMBtu/hr	Natural Gas
R#1406-M1	Advanced Manufacturing Prototype Facility (AMPF) Boilers used to heat the facility.	Two (2) 1.8 MMBtu/hr	Natural Gas
1705-M2	Steam Plant Boilers produce steam heat for buildings in Technical Area I. Original 5 boilers were all decommissioned throughout CY 2008 and four package boilers were installed as substituted equipment until the completion of the Heating System Modernization (HSM) boiler installations in TA-I. The substituted boilers were decommissioned as of May 2009. This permit was terminated with the COA, and the building is set to be demolished in the Spring of 2010.	Three (3) 78.57 MMBtu/hr One (1) 117.09 MMBtu/hr One (1) 214.2 MMBtu/hr Four (4) 9.0 MMBtu/hr	Natural Gas (primary) / Diesel   Natural Gas
1725	Center for Integrated Nanotechnologies (CINT) Boilers used to heat the facility.	Two (2) 6 MMBtu	Natural Gas
1820	Microsystems and Engineering Sciences Applications (MESA) Complex Boilers used to heat the facility.	Two (2) 20.412 MMBtu/hr One (1) 10.206 MMBtu/hr	Natural Gas
1823	Weapons Integration Facility (WIF) Boilers used to heat the facility	Two (2) 8.17 MMBtu/hr One (1) 3.68 MMBtu/hr	Natural Gas
1830	HSM Boilers used to heat buildings in TA-I, and will eventually allow for the decommissioning of the Steam Plant Boilers.	One-Hundred-Twenty-Three (123) 2.0 MMBtu/hr or less	Natural Gas

**NOTES:** MMBtu = Million British Thermal Units  
COA = City of Albuquerque  
TA = technical area



**TABLE 5-13. Generator Hours and Emission Data - 2009**

Permit Number*	Hours/ CY 2009	Emissions (tpy)				
		NO <sub>x</sub>	CO	PM <sub>10</sub>	SO <sub>2</sub>	VOC
#374-M1	9	6.5 E-02	1.4 E-02	4.6 E-03	4.3 E-03	5.2 E-03
#402a	6.6	3.9 E-01	1.0 E-01	6.9 E-03	4.8 E-02	1.1 E-02
	12					
	11.9					
	12.4					
#415-M1	4.1	1.2 E-02	2.6 E-03	8.6 E-04	8.1 E-04	9.7 E-04
#924	9	83.1 E-02	2.2 E-02	1.5 E-03	1.0 E-02	2.3 E-03
#925-M1	9	6.8 E-02	1.8 E-02	1.2 E-03	6.1 E-03	1.9 E-03
#1678-M1	14	1.6 E-01	4.2 E-02	1.5 E-02	1.4 E-02	1.8 E-02
	19	3.4 E-01	9.1 E-02	3.3 E-02	3.1 E-02	3.9 E-02
#1725	23	1.2 E-01	2.7 E-02	8.9 E-03	8.3 E-03	9.9 E-03
#1828	12.4	1.1 E-01	2.6 E-02	3.3 E-03	3.8 E-02	3.3 E-03
#1900b	10.2	1.3 E-02	1.1 E-02	5.8 E-04	4.1 E-03	N/A
#1930 b	1.9	1.16 E-03	7.68 E-04	6.23 E-05	1.93 E-04	N/A

**NOTES:** a = The emission limits stated in the permit are combined emissions, therefore they are calculated annually as a summed emission for all four units.

b = City of Albuquerque has started issuing generator permits with combined NO<sub>x</sub> and VOC emissions.

Permit #1900 is the first permit to have this combination for Sandia.

\*Emergency generator Permit #547 was removed from service during 2009. Emissions were negligible for this unit (< one hour run time with emissions below 1.0 E-04 tpy).

tpy = tons per year

CY = calendar year

N/A = not applicable

### **Background**

The DOE/NNSA/SSO submitted Operating Permit application 515 (DOE 2002) on March 1, 1996, since potential emissions for SNL/NM were greater than 100 tpy of criteria pollutants. The COA has yet to issue the final permit. An updated application is currently being negotiated with the COA.

### **Permit Fee Structure**

The COA regulations require source owners to pay air emission fees, which are implemented under 20.11.2 NMAC, *Fees*. The sources included in the fee determination for SNL/NM include the COA NSR permitted and registered sources, as summarized in Chapter 9, Table 9-1. Total fees are based on the permitted emission limits that are requested in the NSR permit/registration applications, which are

incorporated into the issued NSR permit/registration. In 2009, Sandia paid an annual fee of \$10,065 based on a rate of \$31 per ton of permitted emissions.

### **Stratospheric Ozone Protection**

Title VI of the CAAA of 1990 required EPA to establish regulations to phase out the production and consumption of ozone depleting substances (ODS). ODSs are defined as chlorofluorocarbons (CFC), hydrochlorofluorocarbons (HCFC), and other halogenated chemicals that have been found to contribute to the depletion of the stratospheric ozone layer. EPA has established regulations in 40 CFR Part 82 that require the following: recycling of ODSs during servicing of equipment; establishment of requirements for recycling and recovery equipment, technicians, and reclaimers; repair of substantial leaks

**TABLE 5-14. Emergency Generators Associated with the Permits and Registrations – 2009**

Permit	Description	Size	Fuel Type
R#547	ECF Emergency Generator provides emergency power during unplanned power outages.	One(1) 134.1 hp	Diesel
374-M1	NGF Emergency Generator provides emergency power during unplanned power outages.	One (1) 469 hp	Diesel
402	Emergency Generator Plant provides back-up power to various buildings in TA- I of SNL/NM.	Four (4) 805 hp	Diesel
415-M1	RMWMF Emergency Generator provides emergency power during unplanned power outage.	One (1) 192 hp	Diesel
924	TA- I East L Avenue Emergency Generator provides emergency power during unplanned power outages	One (1) 805 hp	Diesel
925-M1	PETL Emergency Generator provides emergency power during unplanned power outages.	One (1) 671 hp	Diesel
1678-M1	MESA Complex Emergency Generators provide emergency power during unplanned power outages.	One (1) 999hp One (1) 1609 hp	Diesel
1725	CINT Emergency Generator provides emergency power during unplanned power outages.	One (1) 469 hp	Diesel
1828	South-East TA- I Back-up Generator provides backup power during unplanned power outages.	One (1) 750 hp	Diesel
1900	SDF backup generator provides backup power during unplanned power outages.	One (1) 380 hp	Diesel
1930	Building 962 backup generator provides backup power to the operations housed in Building 962.	One (1) 99 hp	Diesel

**NOTES:** hp = horsepower  
 NGF = Neutron Generator Facility  
 TA = technical area  
 SNL/NM = Sandia National Laboratories, New Mexico  
 RMWMF = Radioactive Mixed Waste Management Facility  
 PETL = Processing Environmental Technologies Laboratory  
 MESA = Microsystems and Engineering Sciences Application  
 CINT = Center for Integrated Nanotechnologies  
 SDF = Strategic Defense Facility

TABLE 5-15. HAP Chemical Usage Reportable Data – CY 2009

Permit #	Pounds/Year	Tons/Year
R#936	743	0.4
R#1406	0	0
#374-M1	4	0.002
R#1888	260	0.1
R#1901	125	0.3
R#1902	618	0.2
R#1903	3	0.002
R#1905	0.1	0.0004
R#1906	312	0.1

**NOTES:** HAP = hazardous air pollutant  
CY = calendar year

TABLE 5-16. Facilities with Permits or Registrations for Chemical Use in 2009

Permit #	Description	Chemical Type
R#547	ECF general chemical exhaust from fume hoods	HAP, VOC
R#936	PETL general chemical exhaust from fume hoods	HAP, TAP, VOC
R#1406	AMPF general chemical exhaust from fume hoods	HAP, VOC
415-M1	RMWMF general chemical exhaust from fume hoods	HAP, VOC
R#1888	AMPL general chemical exhaust from fume hoods	HAP, VOC
R#1901	Miscellaneous Buildings general chemical exhaust from fume hoods	HAP, VOC
R#1902	TWT general chemical exhaust from fume hoods	HAP, VOC
R#1903	Solar Tower general chemical exhaust from fume hoods	HAP, VOC
R#1905	EHL general chemical exhaust from fume hoods	HAP, VOC
R#1906	AML general chemical exhaust from fume hoods	HAP, VOC

**NOTES:** ECF = Explosive Components Facility  
 PETL = Processing Environmental Technologies Laboratory  
 AMPF = Advanced Manufacturing Prototyping Facility  
 RMWMF = Radioactive Mixed Waste Management Facility  
 TWT = Trisonic Wind Tunnel  
 EHL = Environmental Health Laboratory  
 AML = Advanced Materials Laboratory  
 HAP = hazardous air pollutant  
 VOC = Volatile Organic Compounds  
 TAP = Toxic Air Pollutants

**TABLE 5-17. TTC Reportable Emissions – CY 2009**

Pollutant	Emissions (tpy)
NO <sub>x</sub>	0
CO	0
PM <sub>10</sub>	0
SO <sub>x</sub>	0
VOC	0
HAP	0

**NOTES:** tpy = tons per year  
CY = calendar year  
TTC = Thermal Test Complex  
VOC = Volatile Organic Compound  
HAP = hazardous air pollutant  
PM<sub>10</sub> = particulate matter (diameter equal to or less than 10 microns)

in refrigeration equipment containing greater than 50 pounds of refrigerant; and establishment of safe disposal standards.

At SNL/NM, ODSs are mainly used for comfort cooling for buildings, air conditioning units in vehicles, and water cooling units in drinking fountains. Halon is contained in some fire suppression systems and some fire extinguishers.

Sandia remains committed to the reduction of ODS and has been working towards replacing Class I refrigerant chillers with a cooling capacity of 150 tons or greater—a secretarial goal set by the DOE. Replacement is part of a larger upgrade to improve the reliability and overall efficiency of the associated chilled water systems. There are currently 100 refrigerant chillers greater than 50 lbs that exist at SNL/NM. Of the existing chillers, seven of those contain Class I refrigerants and are on the list for replacement.

### **5.5.3 Compliance Strategies**

DOE/NNSA/SSO and Sandia have met the conditions of its permits and registrations.

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# 6.0 Wastewater, Surface Discharge, Storm Water Monitoring, Oil Storage & Spill Control

Personnel at Sandia National Laboratories, New Mexico (SNL/NM) conduct effluent monitoring through wastewater, surface water, and storm water monitoring and surveillance programs. Sandia Corporation (Sandia) complies with water quality regulations established by local, state, and federal agencies. U.S. Environmental Protection Agency (EPA) standards are implemented at the state and local level by the New Mexico Environment Department (NMED) and the Albuquerque Bernalillo County Water Utility Authority (ABCWUA). Currently, EPA Region VI implements storm water regulations under the National Pollutant Discharge Elimination System (NPDES). SNL/NM's six wastewater monitoring stations are permitted by the ABCWUA. Sandia also adheres to the water quality guidelines contained in U.S. Department of Energy (DOE) Orders 450.1A, *Environmental Protection Program* (DOE 2008a) and 5400.5, Chg 2, *Radiation Protection of the Public and the Environment* (DOE 1993).

## 6.1 Wastewater Discharge Program

Wastewater that is discharged to the public sewer system from SNL/NM facilities is divided into two categories: sanitary discharges and industrial discharges. Sanitary waste streams include wastewater from restrooms and showers, food service establishments, and other domestic-type activities. Industrial discharges are produced from general laboratory research operations, including electroplating, metal finishing, microelectronic development, and photographic processes.

Sandia closely monitors its liquid effluent discharges to meet regulatory compliance. Sandia further reduces its toxic discharges by implementing Toxic Organic Management Plans (TOMP) and general good housekeeping and engineering practices. Pollution Prevention (P2) measures to reduce, substitute, or eliminate toxic chemicals are implemented, where feasible, as discussed in Section 3.4.

### 6.1.1 SNL/NM and the ABCWUA

#### *ABCWUA Publicly-Owned Treatment Works (POTW)*

SNL/NM's sewer system connects to the ABCWUA's sanitary sewer line at six permitted outfalls. It should be noted that SNL/NM Permit 2069G for activities conducted at the Microelectronics Development Laboratory (MDL) is upstream of the final discharge location, ABCWUA Permit 2069A. Wastewater effluent discharged from any of the six outfalls must meet the ABCWUA's Sewer Use and Wastewater Control Ordinance (SUWCO) requirements. SUWCO information can be found at the American Legal Publishing Corporation's website, which publishes the ABCWUA's Code of Ordinances:

[www.amlegal.com/albuquerque\\_nml/](http://www.amlegal.com/albuquerque_nml/)

All SNL/NM effluent discharge standards were within the ABCWUA's SUWCO established limits during 2009.

#### *Wastewater Compliance Awards*

The ABCWUA's reporting requirements are defined under its SUWCO. The SUWCO specifies the discharge quality and requirements that the ABCWUA will accept at its POTW. Sandia received six "Gold Pre-treatment Awards" from the ABCWUA for the 2008 to 2009 reporting year (November 2008 through November 2009). A "Gold Pre-treatment Award" is given based on a facility's 100 percent compliance with reporting requirements and discharge limits set in its permits, or exceptional source reduction and P2.

### 6.1.2 Permitting and Reporting

The ABCWUA Water Utility Department, Water Reclamation Division, implements the EPA's water quality standards under the authority of the SUWCO. Sandia submits semi-annual wastewater reports to the ABCWUA. The primary regulatory drivers for the Wastewater Program and important program documents and reports are listed in Chapter 9.



### ***Discharge Control Program***

The Water Quality Group (WQG) at SNL/NM maintains a Discharge Control Program to track wastewater discharges resulting from ongoing chemical, manufacturing, and industrial processes conducted at SNL/NM facilities. Facility processes are reviewed for contaminants, concentrations, and discharge frequencies to determine if the effluent will meet regulatory criteria. Once approved, a facility is issued an internal SNL/NM permit, which is reviewed annually. Generally, processes are well characterized and any constituents that are detected over the limits at a wastewater monitoring station can usually be tracked back to the source facility. Corrective actions to mitigate further releases are implemented, as necessary. One-time releases are approved on a case-by-case basis. Buildings that only produce domestic sewage, such as from lavatories, sinks, and fountains, are not required to obtain an internal permit.

### **6.1.3 Wastewater Monitoring Stations**

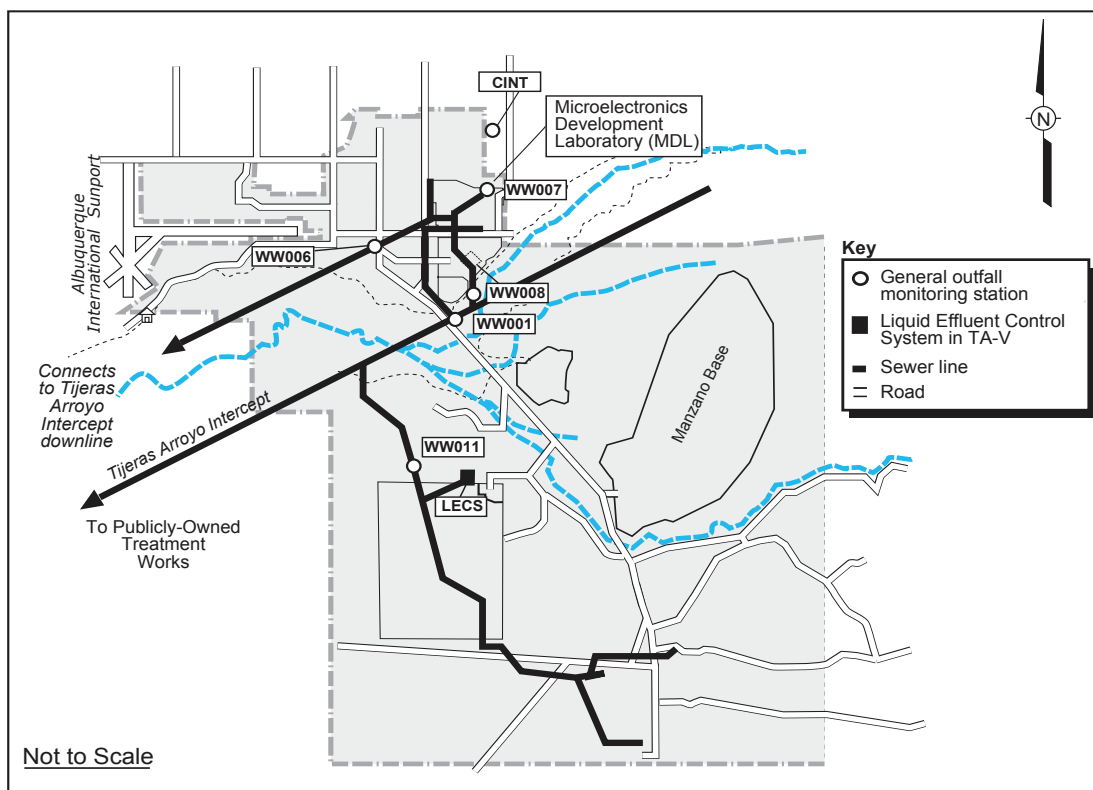
SNL/NM has six on-site monitoring locations permitted by the ABCWUA (Figure 6-1). Wastewater permits are listed in Chapter 9, Table 9-1. All of the wastewater from SNL/NM's six permitted monitoring stations except Permit 2069G and Permit 2238A

(CINT) contain a mixture of sanitary and industrial, which flows into the Tijeras Arroyo Intercept.

The EPA has established categorical pre-treatment standards for specified classes of industrial discharges. Station WW007 (Permit 2069G) monitors the wastewater discharged from the Acid Waste Neutralization (AWN) system within the Microelectronics Development Laboratory (MDL) in Technical Area (TA) I. Laboratory discharges from the MDL and buildings which comprise the Microsystems and Engineering Sciences Applications (MESA) complex may also be configured to discharge to this AWN system. The Center for Integrated Nano Technologies (CINT) facility also utilizes an AWN system for pre-treatment of its process wastewater. SNL/NM discharges approximately 800,000 to 1,000,000 gallons (gal) of wastewater per day to the public sewer system.

### ***Wastewater Monitoring***

All outfall stations are equipped with flow meters which control automatic sampling units and potential of hydrogen (pH) sensors that continuously monitor wastewater 24-hours-a-day, 365-days-a-year. When pH limits are outside regulatory limits, an auto-dialer notifies SNL/NM personnel that pH limits have



**FIGURE 6-1. Wastewater Monitoring Station Locations**

been exceeded. SNL/NM personnel will notify the DOE, National Nuclear Security Administration (NNSA), Sandia Site Office (SSO) personnel of the exceeded limit and DOE/NNSA/SSO are required to report the exceeded limit to the ABCWUA within 24 hours. Wastewater discharge permits and station characteristics are listed in Table 6-1.

Discharge monitoring stations WW001 (Permit 2069A), WW006 (Permit 2069F), WW008 (Permit 2069I), and WW011 (Permit 2069K) are manhole-type installations with permanently installed continuous flow measuring and pH recording instrumentation. Wastewater monitoring stations WW007 (Permit 2069G) and the CINT are located within buildings and are also equipped with installed continuous flow measuring and pH recording instrumentation.

Sandia splits wastewater samples taken from SNL/NM permitted outfalls with the ABCWUA to determine compliance with permit requirements. NMED is notified when sampling is scheduled to occur and is offered the opportunity to obtain samples for analysis. All samples are obtained as 24-hour flow proportional or time-weighted composites. Sandia sends all collected samples to an EPA-approved laboratory for analysis. Sampling results are compared with results obtained by the ABCWUA. Currently, the procedure is to sample randomly from a list of potential pollutants. The ABCWUA determines which parameters it plans to analyze. Monitoring parameters are listed below.

### ***Wastewater Analyte Parameters***

- Metals (aluminum, arsenic, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, silver, zinc)
- Radiological (gamma spectroscopy, gross alpha, gross beta, tritium)
- General Chemistry (chemical oxygen demand (COD), Cyanide, Formaldehyde, Oil and Grease, Phenolic Compounds, Semi-volatile Organic Compounds (SVOC), Soluble fluoride, Volatile Organic Compounds (VOC)

### ***Septic Systems***

Sandia maintains three active septic tank systems and one holding tank in remote areas on Kirtland Air Force Base (KAFB), which are used only for domestic sanitary sewage collection. Since these tanks receive only domestic sewage and no industrial discharges, they do not require sampling prior to pumping and discharge to the public sewer. However, as a Best Management Practice (BMP), Sandia periodically obtains samples from these active septic tank systems prior to pumping and discharge. All septic holding tank records are sent to the State of New Mexico.

### **6.1.4 TA-V Radiological Screening**

SNL/NM maintains research and engineering reactors in TA-V. These reactors and support facilities have the potential to produce radioactive process wastewater that includes liquids from floor drains, lab sinks and other drains located in buildings that use, process

**TABLE 6-1. SNL/NM Wastewater Discharge Permits and Station Characteristics**

Permit		Waste Stream Process
<b><i>General Outfall</i></b>		
2069A (WW001)	All waste streams	
2069F (WW006)	All waste streams	
2069I (WW008)	All waste streams	
2069K (WW011)	All waste streams	
<b><i>Categorical</i></b>		
2069G (WW007)	Laboratory industrial processes	Acid waste from MDL activities
2238A (CINT)	Laboratory industrial processes	Acid waste from CINT activities
<b><i>Not Permitted</i></b>		
LECS	Radiological screening of TA-V process water	

**NOTES:** "All waste streams" include both domestic and industrial discharges.

TA-V = Technical Area V

LECS = Liquid Effluent Control System

MDL = Microelectronics Development Laboratory

CINT = Center for Integrated Nano-Technologies

or store radioactive materials. To ensure that all wastewater from these facilities meets regulatory standards, liquid effluent is separated into two process streams defined as reactor and non-reactor wastewater. Non-reactor wastewater is water from restrooms and non-radioactive laboratory activities. Reactor process wastewater from areas that use, process or store radioactive materials is channeled to holding tanks where it can be screened for radiological contaminants within the Liquid Effluent Control System (LECS). The LECS was developed as a control system to maintain the integrity of the ABCWUA's sanitary sewer system by collecting, analyzing, and handling SNL/NM reactor process wastewater from TA-V reactor activities. Water samples are analyzed for tritium, gross alpha, gross beta, and gamma spectroscopy to ensure radiological levels meet regulatory standards before the water is released to the public sewer system. If radioactivity levels are detected above regulatory limits, the water will not be released to the sanitary sewer system and an alternative disposal path will be found or the radionuclides will be allowed to decay in place over a matter of days or weeks if the contamination is due to short-lived medical radioisotopes. Once the activity is at or below regulatory levels, the water can be safely discharged to the public sewer system. The LECS consists of three 5,000 gal holding tanks with liquid level and radioactive alarm systems, a control room, and an ion exchange/filtration unit (treatment processor). The LECS is an engineered facility operating within an established safety envelope. Discharges to the sanitary sewer from the LECS and other SNL/NM activities have not exceeded standards for radionuclides at any of SNL/NM's wastewater monitoring stations.

### **6.1.5 Summary of Monitoring Results**

During 2009, Sandia split wastewater samples with both the ABCWUA and the NMED. In 2009, laboratory analytical results for these wastewater samples, based on the parameters shown in Section 6.1.3, confirmed that Sandia was in compliance with all ABCWUA regulations. Sampling of SNL/NM facilities was conducted during the months of April and October of 2009. The ABCWUA staff also inspected SNL/NM facilities during the months of April and October to ensure that Sandia was in compliance with the ABCWUA's discharge requirements. All water discharged from the LECS in 2009 also met federal regulatory standards and DOE Orders for radiological levels in wastewater. All analytical results

from sampling conducted in 2009 can be found in Appendix A.

### **6.1.6 Sanitary Sewer System Releases in 2009**

Reportable occurrences and environmental releases in 2009 are discussed in Sections 2.2.1 and 2.2.2. There were no reportable events (ABCWUA permit violations) in 2009.

## **6.2 Surface Discharge Program**

All water and water-based compounds that discharge to the ground surface are evaluated for compliance with New Mexico Water Quality Control Commission (NMWQCC) regulations as implemented by the NMED Groundwater Bureau. These regulations are designed to protect the groundwater and surface water of the state for potential use as a domestic potable water source. The primary regulations and important program documents are listed in Chapter 9.

### **6.2.1 Surface Discharge Approval and Permitting**

Surface discharges are releases of water and water-based compounds made to roads, open areas, or impoundments. Surface discharges are only made with the approval of the Internal Surface Discharge Program. Proposed discharges are evaluated for potential contaminants and concentration levels to determine if the discharge complies with strict water quality guidelines for surface releases. Uncontaminated water discharges must also be approved, since large volumes of water discharged in areas of prior contamination (such as Environmental Restoration [ER] sites) could increase infiltration rates and move contaminants deeper into the soil column. If any discharges do not meet surface water quality standards, alternative methods of disposal are found.

### **2009 Surface Discharge Activities**

Surface discharge requests are generally made when access to a sanitary sewer line is not available, such as in remote locations on KAFB where no sewer lines exist. Typical surface discharge requests include discharges made by the Groundwater Protection Program (GWPP) to dispose of well purge water from groundwater monitoring wells. Wells are purged before a representative groundwater sample

can be taken. Other surface discharges are requested as a result of fire training activities, the need to flush eyewash stations, and the cleaning of building exteriors. In 2009, 24 individual surface discharge requests were made; all met state standards and were approved.

### **6.2.2 Surface Discharge Releases in 2009**

The Surface Discharge Program must be contacted in the event of an accidental release or spill to the ground surface. In 2009, nine releases met the reporting requirements established by NMED. These releases are summarized below and in Chapter 2, Section 2.2.2.

1. A chilled water release occurred near Building 800. The release began on March 2, 2009 for a total duration of approximately 20 minutes. The decision to report this incident to NMED is based on the water released to the environment which contained standard concentrations of water treatment chemicals (SAFETYBROM 6300 [biocide] and CW-8590 [scale inhibitor]). This is an unallowable discharge under the Multi-Sector General Permit (MSGP) for Industrial Activities. The release occurred in the street on the north side of Building 800 which resulted from excavation activities breaking a chilled water line. The total estimated volume from the March 2, 2009, release was conservatively estimated to be no more than 300 to 500 gal of chilled water. It is estimated that about 3 to 10 gal of chilled water entered the storm water system, which did not pose a hazard to surface water, groundwater or the environment considering the concentration of the water treatment chemicals and volume. The location of this release was not within or near any ER sites.

2. A sanitary sewer effluent release occurred at a manhole southeast of Building 861. The release was discovered and reported to SNL/NM's Incident Command on March 4, 2009. The decision to report this incident to NMED is based on a sewer effluent release to a storm water inlet. This is an unallowable discharge under the MSGP for Industrial Activities. The source of the release was due to a sewer line failure between two manholes. A total of approximately 5 gal of effluent was released from the manhole onto the pavement, of which only 1 gal of effluent was released into the storm water inlet, which is located about 7 feet (ft) north and 12 ft west of the manhole. The manhole

located east of Building 755 also was inspected and determined to be within two inches of overflowing. The majority of the effluent remained in the two manholes and connecting sewer line. Another manhole was inspected and determined to be flowing normally indicating a blockage between the two manholes. The location of this release was not within or near any ER sites. A written report was submitted to NMED on March 5, 2009.

3. A hydraulic oil release was discovered at Building 875. SNL/NM personnel investigated the oil leak and found that the oil leak was from a hydraulic lift and its duration was unknown, but the oil leak was noted on March 12, 2009 when the lift was tagged and placed out of service due to abnormal operation. A contractor performed service on the hydraulic system as well as a tightness test of the lift and associated piping. The contractor reported that they suspected a possible leak in the system but could not locate any breach. Approximately two weeks following the initial service, the lift began experiencing the same abnormal behavior and was again tagged and placed out of service. The reservoir of the lift system was checked and found to be low on oil with approximately 2 to 3 gal of hydraulic oil remaining in the reservoir. A leak in the below-grade portion of the lift system was identified and approximately 22 gal of hydraulic oil may have been released to the soil surrounding the below-grade portion of the lift system. The release was reported to NMED on April 21, 2009. The contaminated soil was removed and handled as a New Mexico Special Waste. Confirmatory sampling was done to confirm adequate removal of petroleum contamination and laboratory results will be transmitted to NMED for final closure.

4. A release was reported to SNL/NM's personnel on April 26, 2009. The source of the release was a ruptured casing on a resin filter connected to the de-ionized water system at Building 858. The duration of the release was approximately 45 minutes. Based on flow rates and the duration of the release site personnel estimate that approximately 3,000 gal of de-ionized water flowed from the building and into a storm drain located on the west side of the Building 858 Complex. The decision to report this incident to NMED is based on the water potentially containing hazardous constituents. This is an unallowable discharge under the MSGP.



5. A release to the environment was reported to SNL/NM's Incident Command on June 12, 2009. The release occurred south of Building 850. The release was from a leaking cooling tower and consisted of potable water with a small concentration chemical additives (SAFETYBROM 6300 [biocide] and CW8590 [scale inhibitor]). Based upon the information available, it is believed that approximately 30 gal per minute were released for approximately 20 minutes (total discharge of approximately 600 gal). The released water traveled west approximately 250 ft along the paved roadway where the water entered a drop inlet to the storm drainage system. Approximate volumes of additives that could have been included in the 600 gal release were 2.4 fluid ounces of biocide and 6 fluid ounces of scale inhibitor. The release did not contain chemicals at concentrations that could be harmful to human health and safety, plant and animal life, or cause degradation to the environment. The release is being reported because it constitutes a violation to the terms of Sandia's storm water MSGP issued by the EPA. The release was reported to NMED on June 24, 2009 once this determination was made.

6. A similar release, as described in release 5 above, to the environment was reported by SNL/NM's Incident Commander on July 13, 2009. The release occurred south of Building 850 and was from a leaking cooling tower and consisted of potable water with a small concentration of chemical additives (SAFETYBROM 6300 [biocide] and CW8590 [scale inhibitor]). Based upon the information available, it is believed that a flow of between 10 to 20 gal per minute for approximately 30 minutes was released for a total discharge of approximately 300 to 600 gal. The released water traveled west approximately 250 ft along the paved roadway where the water entered a drop inlet to the storm drainage system. This cooling water is utilized as a heat exchange for the chilled water loop, but no chilled water was released. Approximate volumes of additives that could have been included in the release were 2.4 fluid ounces of biocide and 6 fluid ounces of scale inhibitor. The release did not contain chemicals at concentrations that could be harmful to human health and safety, plant and animal life, or cause degradation to the environment. The release is being reported because it constitutes a violation to the terms of Sandia's storm water MSGP issued by the EPA. The release was verbally reported to NMED on July 15, 2009 once this determination was made. The source of the release was a malfunctioning distribution

system at the top of the cooler tower. The cause of the release was suspected to be from blockages within the distribution tower and was under investigation when a third release occurred. See release 7 described below.

7. A release to the environment occurred on July 18, 2009. The release occurred south of Building 850 from a leaking cooling tower. This was the third release from this cooling tower within a 31 day period. The discharge was stopped within approximately 40 minutes of being detected. Based upon the information available, it is believed that a flow of between 10 to 20 gal per minute for a total discharge of approximately 400 to 800 gal. The release did not contain chemicals at concentrations that could be harmful to human health and safety, plant and animal life, or cause degradation to the environment. The release is being reported to NMED because it constitutes a violation to the terms of Sandia's storm water MSGP issued by the EPA. Due to the frequency of the discharges from this cooling tower, an extensive investigation was conducted by facilities personnel. It was determined that the first release was an isolated event due to the buildup of scale. The second and third releases were related and were caused by the premature breakdown of the media fill material used in the tower. This broken down media fill material clogged the fill-pan, causing the overflow. A corrective action was developed and implemented and the malfunctioning media fill was replaced with a different media fill type as recommended by the cooling tower manufacturer.

8. A release to the environment occurred on August 16, 2009. The release occurred in the southeast portion of TA-III. The release was from a ruptured irrigation pipe and consisted of potable water. The discharge was stopped immediately after being detected. Based upon the information available from the metered system, it is believed that approximately 300,000 gal of potable water was discharged. The released water traveled east and south approximately 300 ft along the dirt roadway, pooling in depressed areas. None of the water entered the sewer or storm drainage system. This water is utilized in an irrigation system to promote final vegetative cover of a disturbed soil area. The release did not contain chemicals that could be harmful to human health and safety, plant and animal life, or cause degradation to the environment. The release did not cause an on-site impact but did cause minimal erosion. The release is being reported to NMED because it constitutes a violation to the terms

of Sandia's storm water MSGP issued by the EPA. The irrigation system will be operated manually, and if the timer system is reinstated, then it will be operated only when SNL/NM personnel are on-site.

9. A release to the environment was reported to SNL/NM's personnel on August 28, 2009. The release is being reported to NMED because it constitutes a violation to the terms of Sandia's storm water MSGP issued by the EPA. The release occurred near the intersection of Wyoming Boulevard and Hardin Boulevard. The release occurred from the rupture of an eight inch potable water line during site grading. The site was undergoing demolition activities associated with the removal of an aboveground storage tank (AST) containing diesel fuel. The tank was completely decontaminated and demolished (D&D) at the time of the release. As part of the D&D activities, the soil near the tank was evaluated for visual staining or odor, and confirmatory soil samples were collected. No release of petroleum products in the soil was noted. The discharge was stopped after approximately 25 minutes and it is believed that approximately 37,000 gal of potable water was discharged. The released water traveled east and south, accumulating in depressed areas on the site and infiltrated into the soil column at various locations. It is estimated that no more than one to four percent (370-1,480 gal) of the total release left the site and entered the storm drainage system on Hardin Boulevard to the south of the spill location. The released potable water did not contain chemical additives deemed harmful to human health and safety, plant and animal life, or which could cause degradation to the environment. The release caused minimal erosion on-site. The release is being reported to NMED because the potable water did enter the storm drain. The ruptured water line has been repaired and has returned to normal operation. Clean fill (soil) is being brought into the area to bring the site back to original grade. The potable water line has been marked by stakes.

### **6.2.3 Pulsed Power Evaporation Lagoons**

The Surface Discharge Program at SNL/NM reports water quality results from routine samples taken from two surface discharge lagoons in TA-IV. Both lagoons are permitted through NMED in Discharge Plan (DP-530). The two surface discharge lagoons are primarily used to contain and evaporate water that

collects in the secondary containments around seven outdoor oil storage tanks used to store dielectric oil. The secondary containments are designed to hold the entire content of the tanks in the event of an accidental release. Significant volumes of precipitation can collect in the containments during storm events. The water is visually inspected for oil contamination and any oil present is skimmed off prior to discharge to the TA-IV lagoons.

The original DP-530 was issued to SNL/NM for discharges from the Pulsed Power Development Facilities (PPDF) located in TA-IV to Lagoons #1 and #2 on March 8, 1988. The DP-530 was submitted pursuant to New Mexico Administrative Code (NMAC) 20.6.2.3106 of NMWQCC regulations, and was approved pursuant to 20.6.2.3109 NMAC. A permit renewal application for DP-530 was submitted to NMED and was approved on September 12, 2007, and will expire on September 12, 2012. The monitoring and reporting requirements are listed in Table 6-2.

Lagoon #1 was sampled on May 11, 2009, prior to being discharged to the ABCWUA sanitary sewer system after analysis of the results indicated that all detected constituents met ABCWUA discharge requirements. Lagoon #1 was cleaned and the liner inspected and potential imperfections were repaired as a preventative maintenance measure. Monthly inspections were performed and documented in checklists filed in the Customer Funded Record Center (CFRC) and with DOE/NNSA/SSO. In October of 2009, the Lagoon #2 liner was inspected and vegetation was removed. Monthly inspections for Lagoon #2 were performed and documented. No sampling of Lagoon #2 was conducted since only storm water falls into the lagoon from storm events. No discharges from the PPDF to Lagoon #2 and no surface discharges occurred during 2009.

## **6.3 Storm Water Program**

### **6.3.1 Storm Drain System**

Storm water runoff flowing over the ground surface has the potential to pick up and transport contaminants. The Storm Water Program works in coordination with the P2 Program, the Surface Discharge Program, Facilities Engineering, and the ER Project to



**TABLE 6-2. NMWQCC Monitoring and Reporting Requirements**

Action	Frequency	Reporting
Inspection of Lagoons	Monthly	Documented in checklists
Drain, clean and inspect lagoon and liner	Annually	Annually
Water-level readings	Monthly	Annually
Inspect sump stations and clean as needed	Quarterly	Annually
Major cations, anions, and TDS	Biennially	Biennially
Purgeable organics using EPA Method 8240	Biennially	Biennially
Extractable organics using EPA Method 8270	Biennially	Biennially

**NOTES:** NMWQCC = New Mexico Water Quality Control Commission  
TDS = total dissolved solids

implement measures and BMPs to prevent or reduce potential contaminants from being transported in storm water runoff. Potential contaminants may derive from:

- Oils and solvents from machine shops and manufacturing areas,
- Vehicle residues from streets and parking lots,
- Hazardous chemicals and metals from waste handling facilities,
- Residual radioactive and hazardous constituents from Solid Waste Management Units (SWMU),
- Building material contaminants from construction activities, and
- Pesticides and fertilizers from landscaped areas.

Sandia controls the potential contaminants that may be picked up by storm water runoff by routing all industrial waste water to the sanitary sewer and storing most chemicals indoors. Sandia also limits storm water contact with chemical storage containers and carefully controls runoff in areas where wastes, chemicals, and oils are stored or handled. Secondary containments for all outdoor oil storage tanks and chemical containers prevent potential pollutants from being transported in storm water runoff. Some facilities, such as the Hazardous Waste Management Facility (HWMF) and the Radioactive and Mixed Waste Management Facility (RMWMF) are designed to divert all runoff from the facility to a lined catchment basin. Water that accumulates in these basins evaporates. If evaporation is not adequate due to meteorological conditions, the accumulated water is evaluated and pumped to either

the storm drain system or to the sanitary sewer for disposal. Per the RCRA Part B permit, discharge of the water is allowed if there has been no spills or releases or no visible sheen or excessive debris. If discharged to the sanitary sewer approval must be obtained from the ABCWUA through DOE/NNSA/SSO.

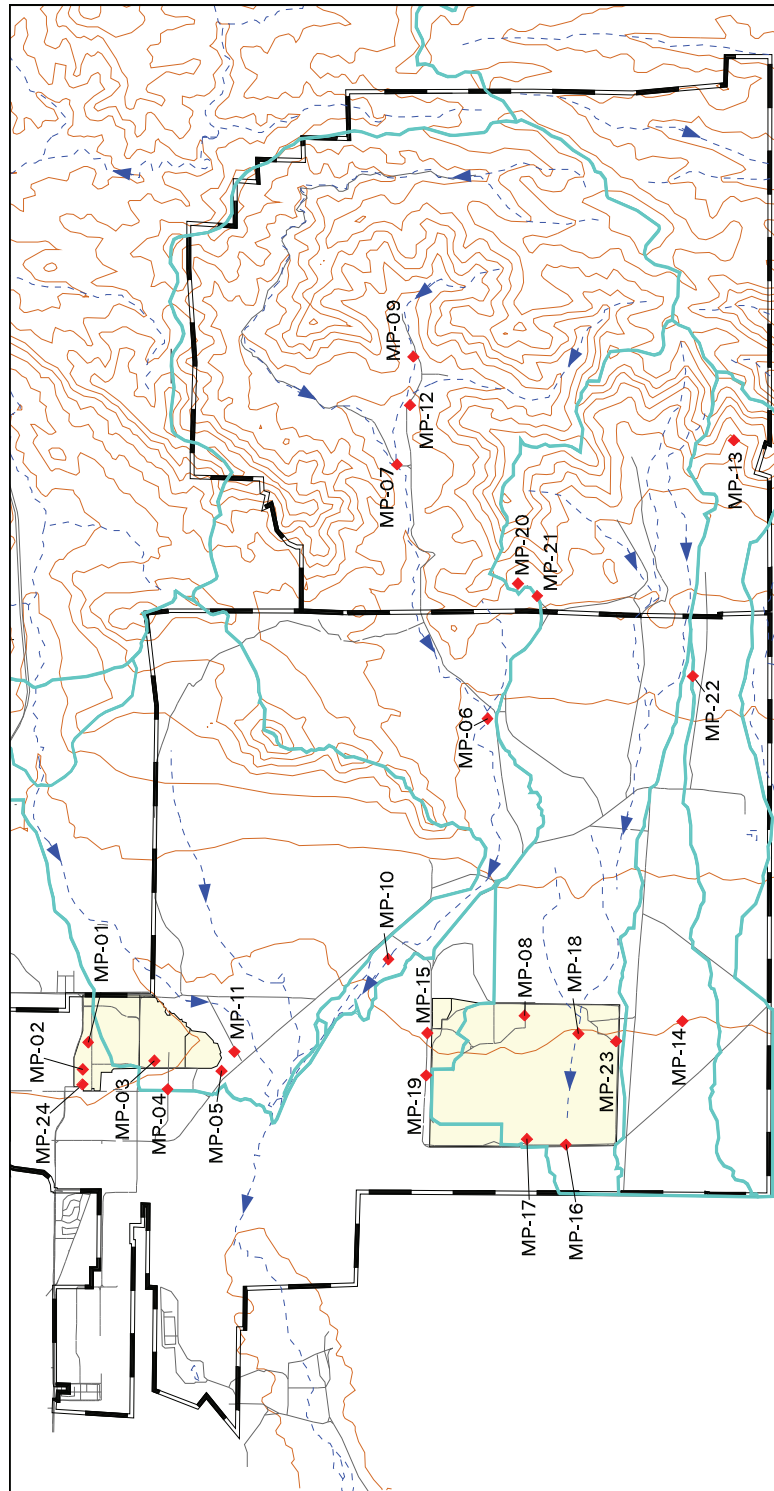
#### ***NPDES Regulations***

NPDES regulations, under the Clean Water Act (CWA), require any point source discharges to be permitted. Any runoff that flows into the Tijeras Arroyo through a channel, arroyo, conduit, or pipe is considered a discharge point. Overland surface flow or “sheet” flow that drains into Tijeras Arroyo is not considered a point source discharge.

The State of New Mexico has defined “Surface Waters of the State” to include “Waters of the U.S.” and all other surface water in the State. In order to assist New Mexico in protecting its water resources, the EPA can apply NPDES regulations to discharges to New Mexico’s surface waters, even if those waters are not “Waters of the U.S.”

As shown in Figure 6-2, Tijeras Arroyo enters KAFB from the northeast, flows just south of TA-I, TA-II, and TA-IV, exits at KAFB’s west boundary, and continues about eight miles to its discharge point at the Rio Grande River. The arroyo has created a significant topographic feature across KAFB where erosion of unconsolidated basin sediments has resulted in a channel over one half mile wide in some areas.

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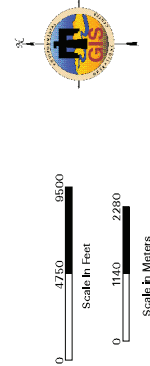


### Legend

- ◆ Storm Water Monitor Point (MP-#)
- Watershed Basin Boundaries
- Road
- KAFB / USFS Withdrawn Area Boundary

- Major Surface Drainage
- 200-ft. Contour
- Technical Area

Sandia National Laboratories, New Mexico  
Environmental Geographic Information System



**FIGURE 6-2.** Storm Water Monitoring Point Locations at SNL/NM

### ***Watersheds at SNL/NM***

NPDES permits are required if storm water runoff discharges to “Waters of the U.S.” or “Surface Waters of the State.” Sandia facilities in TA-I, TA-II, and TA-IV have storm drains, culverts, and channels that divert storm water runoff to discharge points on the north side of Tijeras Arroyo, which is classified as “Waters of the U.S.” Sandia also conducts various activities in remote mountain and canyon areas in the Arroyo del Coyote watershed, which empties into Tijeras Arroyo northwest of the KAFB Golf Course. Activities in all of these areas are evaluated for possible NPDES permitting.

Drainages south of the Arroyo del Coyote watershed are generally short and undeveloped. Runoff in this area infiltrates quickly into highly permeable soils. Discharges from these areas do not reach any designated “Waters of the U.S.,” but they do discharge to “Surface Waters of the State;” therefore, NPDES permits are also required for facilities in these areas. TA-III, TA-V, and several remote sites are located in this area.

### ***NPDES Permit***

The EPA provides regulatory oversight for SNL/NM’s Storm Water Program. Operators must submit a Notice of Intent (NOI), implement control measures, sample storm water runoff for comparison to national benchmark values, and develop site-specific Storm Water Pollution Prevention Plans (SWP3). A NOI was submitted to the EPA for coverage under the new 2008 MSGP before the January 5, 2009 deadline and in November 2009 EPA issued a new permit.

The existing SWP3 was updated to comply with the new MSGP requirements. New monitoring locations for compliance with this new permit were installed. Key facilities affected by NPDES regulations are listed in Table 6-3. Chapter 9 lists all applicable regulations and program documents.

A construction permit requires protection of storm water runoff during and after construction. All areas of the site that are susceptible to erosion must be stabilized upon completion of the project. A General Construction Permit (GCP) 2003 was issued for a five-year term, and expired July 1, 2008. The EPA issued a GCP in 2008 that is in effect from June 30, 2008 to June 30, 2010.

In December 2009, 18 storm water construction permits were active. Construction permits are listed in Chapter 9, Table 9-1.

## **6.3.2 Storm Water Monitoring Stations**

Figure 6-2 illustrates the storm water Monitoring Point (MP) locations. Using the locations of the MSGP sites along with the watershed boundaries and flow patterns the storm water monitoring points were located at points that would best be suited to collect a representative sample of storm water runoff. The locations identified were then checked in the field where slight adjustments were made. This understanding between the hydrologic connection between the watershed outfalls, drainage patterns and locations of MSGP sites allowed for the selection of the monitoring points where representative samples could be collected.

## **6.3.3 Routine Inspections**

All routine inspection results are attached to the SWP3. Routine inspections include the following:

- Monitoring station inspections are conducted monthly to ensure that samplers and other equipment are functioning properly.
- Material storage area inspections are conducted quarterly. All waste handling areas, vehicle and equipment cleaning areas, and loading and unloading areas are inspected for uncovered and unprotected potential contaminant sources and spills. These inspections increase personnel awareness and responsibility for storm water P2.
- Wet weather inspections (visual monitoring) are conducted quarterly during a storm event, if possible, but generally during the rainy season from April through September. Samples are collected and visually inspected for foaminess, clarity, and the presence of oil. The pH of the discharge is also measured and recorded. These inspections also provide an opportunity to check for broken levees and floating debris.
- Dry weather inspections are conducted quarterly when storm drains and ditches are dry, primarily to detect illicit discharges. In general, only storm water is allowed in the storm drain system; however, with approval from the Surface

**TABLE 6-3. SNL/NM Facilities Subject to Storm Water Permitting**

*These facilities are in areas where storm water can potentially drain to Tijeras Arroyo*

Description of SIC Code*	Potential Pollutants and Impacts	Applicable SNL/NM Facilities **
<i>NPDES Multi-Sector Storm Water Permit</i>		
Scrap and Waste Recycling	- Various solid objects with potential residual surface contamination	- Reapplication and Storage Yard - Solid Waste Transfer Station
Hazardous Waste Treatment, Storage, or Disposal Facilities	- Regulated hazardous chemical and radioactive waste	- HWMF - Manzano Storage Complex - RMWMF - CWL - TTF - AHCF - CAMU - SWMUs (including those in Lurance and Madera Canyons)
Electronic and Electrical Equipment Manufacturing	- Raw chemical storage such as acid and sodium hydroxide - Electroplating processes	- 858 Complex - AMPL - CINT - NGF
Fabricated Metal Products	- Metal Fabrication - Turnings	- Machine Shop
<i>Short-Term Construction Permits</i>		
Construction Permits - 2009	- Building material pollutants - Disturbed soil	- MESA - 20 <sup>th</sup> Street Stockpile Area - Mixed Waste Landfill Cover - TA-III Borrow Site - TA-III Cable Debris - Heating Systems Moderization - I Ave, 7th and 8th Street Infrastructure and Utility Improvements - TA-II Fence Removal - I Ave and 11th Street Mall Waterline Project - T-Bldg and MO Removals - 9940 Complex - Building 957 Parking Lot - Backfilling Horse Pond - G, H, 11 <sup>th</sup> Street - Liquid Natural Gas - Thunder Range - TA II Escarpment - 18 <sup>th</sup> Street & K Avenue - Ion Beam Laboratory

**NOTES:** \*The EPA requires a National Pollution Discharge Elimination System (NPDES) Storm Water Permit for all industrial facilities that have processes defined in the Standard Industrial Classification (SIC) codes listed in Appendix A of 40 CFR 122.

\*\*Applicable facilities are monitored under the expanded Storm Water Program, which was in effect in October 2001. The expanded program is documented in the revised Storm Water Pollution Prevention Plan (SWP3) (SNL 2008a).

AMPL = Advanced Manufacturing Process Laboratory  
HWMF = Hazardous Waste Management Facility  
RMWMF = Radioactive Material & Waste Management Facility

CWL = Classified Waste Landfill

CINT = Center for Integrated Nano Technology

SWMU = Solid Waste Management Unit  
CAMU = Corrective Action Management Unit  
TTF = Thermal Treatment facility  
NGF = Neutron Generation Facility  
AHCF = Auxiliary Hot Cell Facility  
SNL/NM = Sandia National Laboratories, New Mexico

Discharge Program, water that meets NPDES permit conditions can be discharged to storm drains. An example of NPDES permit-approved discharges would be water used during fire training exercises or fire hydrant testing. Dry weather inspections also provide an opportunity to inspect ditches for excess vegetation, accumulated sediment, and debris. Storm channels are cleaned out annually, or as necessary.

Annual inspections of all permitted facilities and the entire storm water system are conducted. After the inspections have been completed, a report is generated indicating the extent of the inspections and certifying that is in compliance with the NPDES permit. Any inconsistency between the SWP3 and conditions at the facilities is noted in the report. If changes to the SWP3 are required as a result of these inspections, revisions are initiated. If potential pollution problems are uncovered, they are noted in the report along with a schedule for addressing those problem areas.

#### ***Sampling Protocols***

Storm water associated with industrial activities is and has been monitored in accordance with the requirements of MSGP 2000; this consisted of quarterly analytical sampling to be conducted in the second and fourth year of the five year permit, weather permitting. Thus samples were collected during 2002 and 2004. Due to Albuquerque's semi-arid climate and high infiltration rates, precipitation rarely produces adequate runoff for monitoring in the months of October through March with the most consistent rain occurring from April through September. Information regarding Albuquerque's precipitation can be found at the following website:

<http://www.weather.gov/climate/index.php?wfo=abq>

The new MSGP issued in January of 2009 required sampling to occur beginning April 1, 2009, however because the new MSGP was not issued by EPA until November 2009 no sampling was performed under the new permit. Storm water sampling under this new permit will begin in the summer of 2010. Fiscal Year (FY) 2004 was the fourth year of the permit and was the last year analytical monitoring was required except for fecal coliform. However, as a best management practice, environmental surveillance sampling was performed, see Section 6.3.4.

After a rainfall of sufficient intensity and duration (as defined in the regulation), storm water runoff flowing through each monitoring station is collected as a grab sample by the automatic sampler. The discharge is collected within the first 30 minutes of the runoff event to allow for the sampling of any residues picked up in the soil upstream of the station. All samples are sent to off-site laboratories and analyzed according to protocols established by the EPA.

### **6.3.4 2009 Activities**

#### ***2009 Sampling Results***

Quarterly visual sampling was conducted in 2009. Analytical sampling was not required for this year of the permit, however environmental surveillance sampling was done for total recoverable metals, total suspended solids (TSS), and COD. The monitoring data are presented in Appendix D and are consistent with natural background levels and did not suggest a pollutant "hot spot", thus current control measures are adequate.

Visual observations of storm water were performed when there was adequate runoff to collect a sample. The majority of the visual observations of storm water quality were done in the summer months and these assessments did not produce any indications of storm water pollution.

A fecal coliform sample was collected in September 2009 at SNL/NM's primary outfall to Tijeras Arroyo. The lab reported a positive result for fecal coliform at 60,000 CFU/100ml and this result was submitted to the State of New Mexico in October 2009.

### **6.4 Oil Storage & Spill Control**

The oil storage capacity at SNL/NM was reduced from 3.6 million gal in 51 ASTs and five USTs to 2.1 million gal in 46 ASTs and five USTs. This does not include oil-containing equipment and transformers. Additional oil storage capacity in 55 gal drums occurs throughout the site on an as needed basis. All oil storage sites with regulated containers must be equipped with secondary spill containment. Secondary containment structures include concrete-lined basins, retaining walls, containment reservoirs, earthen berms, sloped pads, trenches, and containment pallets.



A Spill Prevention Control and Countermeasures (SPCC) Plan is required under the CWA. SNL/NM's SPCC Plan was revised in 2005 to incorporate changes to 40 Code of Federal Regulations (CFR) 112 and 20.5 NMAC. The focus of these 40 CFR 112 regulations is to protect specifically defined waterways, or "navigable waters of the United States" from potential oil contamination. "Navigable waters" is a broad term that includes rivers, lakes, oceans, and water channels (tributaries), such as streambeds and arroyos that connect to a river. This applies to the Tijeras Arroyo, which discharges to the Rio Grande. The 20.5 NMAC regulations are to reduce, mitigate and eliminate the threats to the environment posed by petroleum products released from storage tanks.

SNL/NM's SPCC Plan describes oil storage facilities and the mitigation controls in place to prevent inadvertent discharges of oil. Facilities at SNL/NM subject to the regulations include:

- Oil storage tanks (USTs and ASTs),
- Bulk storage areas (multiple containers), and
- Temporary or portable tanks.

Table 9-1 lists the permit numbers for those tanks that are registered with NMED. SNL/NM's State of New Mexico Owner ID Number is 14109.

#### ***UST***

Five USTs are currently operating at SNL/NM. Two 20,000 gal fiberglass USTs at SNL/NM are registered with NMED; one additional UST, used solely for emergency power generation, is exempt from New Mexico requirements, but is covered by federal regulations in 40 CFR 280; and two USTs in TA-III are exempt from state and federal requirements because they contain insignificant quantities of regulated substances.

#### ***AST***

Forty-six ASTs are currently operating at SNL/NM. In 2002, the State of New Mexico passed oil storage regulations that required the registration of all oil storage tanks with a storage capacity greater than 1,320 gal, but less than 55,000 gal. Seven ASTs at SNL/NM are registered with NMED.



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# 7.0 Groundwater

The Groundwater Protection Program (GWPP) and the Environmental Restoration (ER) Project collect groundwater data at Sandia National Laboratories, New Mexico (SNL/NM). Both programs coordinate to monitor wells throughout SNL/NM operational areas and ER sites. Groundwater monitoring is conducted on a quarterly, semi-annual, or annual basis, depending on individual project areas. Water level measurements are conducted monthly and quarterly.

Specific tasks performed in Calendar Year (CY) 2009 by the GWPP and ER are shown in Figure 7-1. It illustrates the coordination with outside groundwater monitoring agencies as a key component of the GWPP and the ER Project.

Groundwater wells located on and around Kirtland Air Force Base (KAFB) are illustrated in Figure 7-2. The wells include ER monitoring wells, GWPP surveillance wells, Albuquerque Bernalillo County Water Utility Authority (ABCWUA) production wells, KAFB production wells, U.S. Geological Survey (USGS) monitoring wells, and KAFB Installation

Restoration Program (IRP) wells. In CY 2009, 66 wells and one spring were sampled at SNL/NM by Sandia Corporation (Sandia).

## 7.1 Overview of Groundwater Programs at SNL/NM

### 7.1.1 GWPP Activities

The primary function of the GWPP is to conduct groundwater surveillance to detect possible groundwater contamination from current operations or undiscovered legacy contamination. The purpose of groundwater monitoring involves completing the following objectives:

- Establish baseline water quality and groundwater flow information for the groundwater system at SNL/NM,
- Determine the impact, if any, of SNL/NM's operations on the quality and quantity of groundwater, and Demonstrate compliance with all federal, state, and local groundwater requirements.

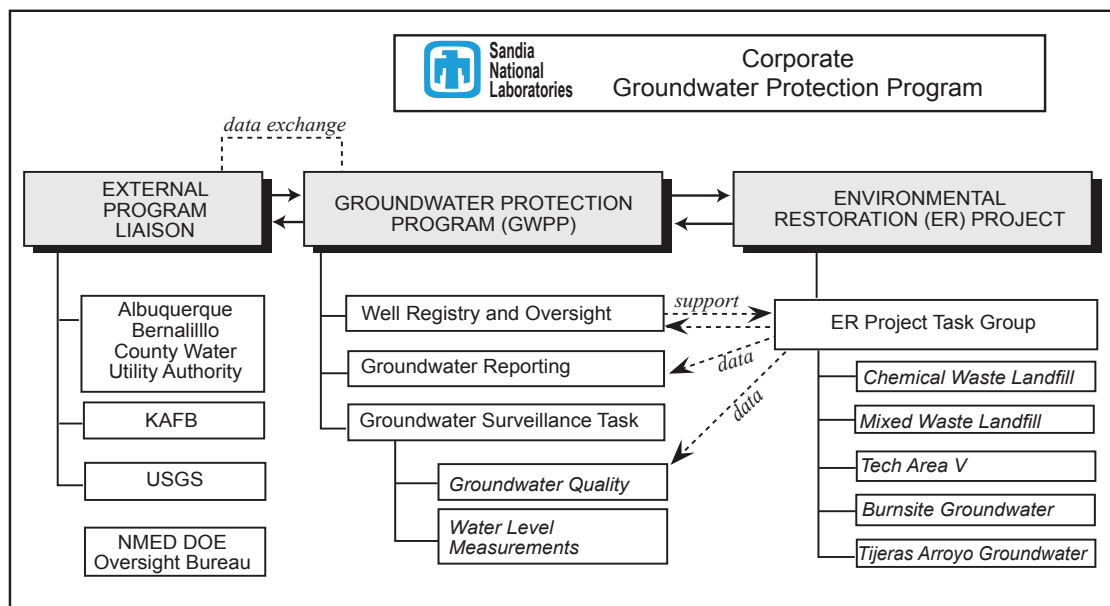
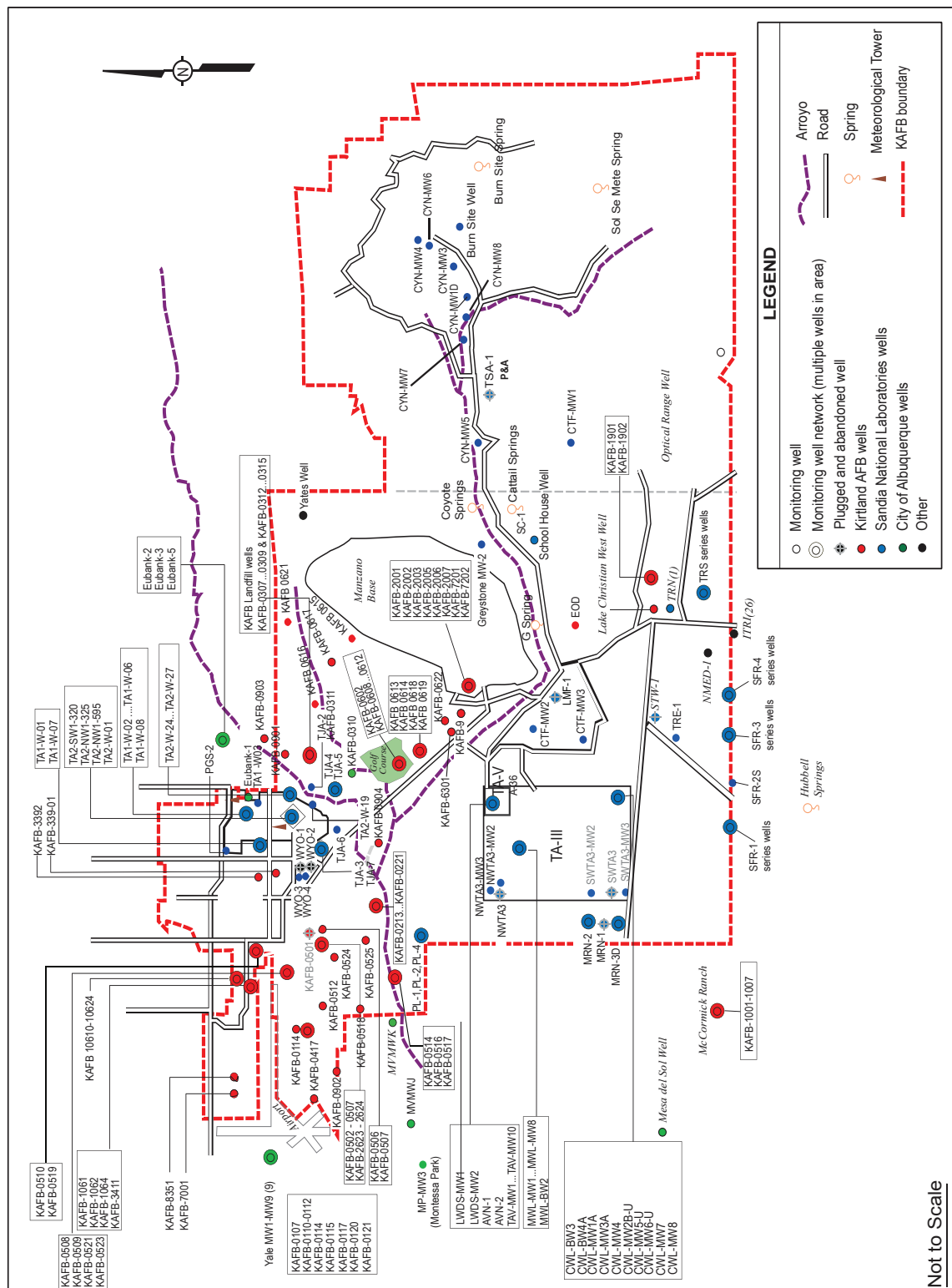


FIGURE 7-1. SNL/NM's Groundwater Programs and Interfaces for Tasks Performed in CY 2009



The GWPP is responsible for tracking information on all wells owned by Sandia, including ER Project wells and characterization boreholes. The primary purpose of the GWPP Well Registry and Oversight Task is to ensure that all wells owned by SNL/NM are properly constructed and maintained to protect groundwater resources, and ensure groundwater sample representativeness. The GWPP works together with well owners to review new well design proposals, coordinate installation contracts, record construction information, track well ownership and maintenance records, perform annual well inspections, and consult with owners if, and when, plugging for the abandonment or replacement of a well or borehole is required.

In CY 2009, groundwater surveillance sampling was conducted at 14 wells and one spring.

Requirements applicable to the GWPP, such as the U.S. Department of Energy (DOE) Orders and the Compliance Order on Consent (COOC) are listed in Chapter 9, and discussed in Chapter 2.

### ***Trend Data***

The GWPP performs trending on groundwater surveillance results by comparing past years' data with the current year's results. Multi-year trend plots for analytes exceeding maximum contaminant levels (MCL) and human health related maximum allowable concentrations (MAC) are presented in Appendix B, which provides data trends and graphical representation. The data is analyzed to determine if the results are within the normal range of expected values, or if a significant difference is present — this allows early detection and possible source identification when contaminants are at levels below regulatory concern. Conversely, unchanging baseline levels demonstrate Sandia's successful implementation of best management practices (BMP) for groundwater protection.

### **7.1.2 ER Project Groundwater Activities**

ER Project activities are conducted per the Resource Conservation and Recovery Act (RCRA) regulations, which mandate the cleanup and management of active and inactive treatment, storage, and disposal (TSD) facilities. The COOC imposes additional

requirements. Applicable regulations are listed in Chapter 9, and the regulatory basis for the ER Project is discussed in Section 3.2.

There are currently five ER Project areas with ongoing groundwater investigations:

- Chemical Waste Landfill (CWL),
- Mixed Waste Landfill (MWL),
- Technical Area V (TA-V) Groundwater Investigation,
- Tijeras Area Groundwater (TAG) Investigation (TA-I, TA-II, & Tijeras Arroyo), and
- Burn Site Groundwater (BSG) Investigation (Lurance Canyon).

CWL – The CWL is a 1.9-acre former disposal site located in the southeastern corner of TA-III at SNL/NM. From 1962 until 1981, the CWL was used for the disposal of chemical, radioactive, and solid waste generated by SNL/NM research activities. From 1982 through 1985, only solid waste was disposed of at the CWL. In addition, the CWL was used as a hazardous waste drum storage facility from 1981 to 1989. A comprehensive summary of the CWL disposal history is presented in the NMED approved *CWL Closure Plan* (SNL 1992) and the *Landfill Excavation Voluntary Corrective Measure (LE VCM) Final Report* (SNL 2003). Groundwater contaminants of concern (COC) include trichloroethene (TCE), chromium, and nickel. Historical groundwater analytical results are summarized in the *CWL Corrective Measures Study (CMS) Report* (SNL 2004). Nine wells were sampled from January through December 2009, including two background wells and seven down gradient monitoring wells. The CWL groundwater results are discussed further in Section 7.2.2.

MWL – The MWL is a 2.6 acre former disposal site located in TA-III. It was operational from 1959 to 1988, and was used to dispose of low-level radioactive and mixed waste (MW). Tritium is the only COC that has been released to adjacent soils from the MWL. Seven monitoring wells at the MWL were sampled in Fiscal Year (FY) 2009, including one upgradient well, one on-site monitoring well, and five downgradient monitoring wells.

TA-V – The Gamma Irradiation Facility (GIF), the Hot Cell Facility (HCF), and two reactor facilities are located in TA-V. From 1967 to 1971, the Liquid Waste Disposal System (LWDS) located in TA-V was used to dispose of reactor coolant water in the subsurface. Groundwater COCs at the LWDS are nitrate and VOCs such as TCE, which was first detected in the groundwater in 1993. There are currently 12 active monitoring wells at this site that were sampled during CY 2009.

TAG – The TAG Investigation includes groundwater beneath TA-I, TA-II, and Tijeras Arroyo. There were 21 monitoring wells routinely sampled in the TAG study area during CY 2009. Of these, 10 are regional aquifer wells, and 11 are perched groundwater system wells. The perched groundwater system consists of water-bearing sediments located several hundred feet above the regional water table that have insufficient yield to be developed for domestic use. TCE and nitrate are the COCs for TAG.

BSG – The BSG area is located around the active Lurance Canyon Burn Site (LCBS) facility. Groundwater investigations were initiated in 1997 at the request of New Mexico Environmental Department (NMED) after elevated nitrate levels were discovered in the LCBS non-potable water-supply well. In 1997, one groundwater monitoring well was installed. In 1999, two additional wells were installed, including two piezometers to detect and monitor groundwater flow at the interface of the arroyo sediments and bedrock. To date, both piezometers have remained dry. Three wells were installed in 2005 and 2006. All six monitoring wells were sampled during CY 2009.

## **7.2 Groundwater Quality Analysis Results**

Analytical results for groundwater quality monitoring conducted by the GWPP and the ER Project are compared to state, federal, and DOE guidelines shown in Table 7-1. The frequency of groundwater quality monitoring and sample collection performed at SNL/NM is shown in Table 7-2. All groundwater samples are collected and analyzed in accordance with EPA protocols.

Water quality results for both the GWPP and the ER Project are summarized in the following pages and in Table 7-3. Exceedances of regulatory criteria for

samples collected by SNL/NM monitoring activities are listed in Table 7-4.

### **7.2.1 GWPP Surveillance Results**

Annual sampling of groundwater was conducted during the period of March 11, 2009 to April 21, 2009. Samples were collected from 14 wells and one spring. Groundwater surveillance samples for the GWPP were analyzed for the following parameters:

- VOCs,
- dissolved target analyte list (TAL) metals plus uranium (except total mercury),
- major ions including nitrate plus nitrite [NPN] (reported as nitrogen),
- total cyanide,
- alkalinity/total phenols,
- total halogenated organics (TOX),
- high explosive (HE) (at selected wells),
- gamma spectroscopy,
- radium-226 and radium-228, and
- gross alpha/beta activity.

TAL metals, excluding mercury, were analyzed from filtered groundwater samples to conform to New Mexico Water Quality Control Commission (NMWQCC) Standards for dissolved concentration limits. An unfiltered groundwater sample from each well was analyzed for total mercury.

Groundwater samples in seven wells (CTF-MW2 & 3, SFR-2S, SWTA3-MW3 & 4, and TRE-1) were analyzed for HE. The designated wells are used to establish background concentrations of HE at the Dynamic Explosives Test Site (DETS) east and south of TA-III and to monitor potential groundwater impacts from explosive testing.

Field measurements taken at each well included alkalinity, turbidity, dissolved oxygen, potential of hydrogen (pH), specific conductivity, oxidation reduction potential (or redox [Eh]), and temperature.

#### VOC Analysis

No VOCs or HE compounds were detected at concentrations above MCLs or MACs in any groundwater sample. Chloroform, toluene, vinyl chloride, and 1,2,4-trimethylbenzene were the only

**TABLE 7-1. Guidelines Used for Groundwater Quality Sample Comparisons**

Regulation/Requirements	Standards and Guides	Regulating Agency
National Primary Drinking Water Regulations (40 CFR 141)	Maximum contaminant level (MCL)	U.S. Environmental Protection Agency (EPA)
New Mexico Water Quality Control Commission (NMWQCC) <sup>(1)</sup> Standards for Groundwater (20 6.2.3103A NMAC Human Health Standards)	Maximum allowable concentration (MAC)	NMWQCC
DOE Drinking Water Guidelines for Radioisotopes <sup>(2)</sup> (DOE Order 5400.5)	Derived concentration guide (DCG)	Department of Energy (DOE 1993)

**NOTES:** CFR = Code of Federal Regulation

<sup>(1)</sup> MACs for Human Health and Domestic Water Supply Standards are identified in the analytical results tables in the appendices. Domestic water supply standards are based on aesthetic considerations, not on direct human health risks.

<sup>(2)</sup> DOE drinking water guidelines set allowable radionuclide levels in drinking water. The levels are calculated based on published DCGs and correspond to a 4 millirem-per-year (mrem/yr) dose from chronic exposures. This is equivalent to four percent of the DCG for ingestion, which is based on an exposure of 100 mrem/yr. These may be different than EPA's standards, where established.

**TABLE 7-2. Sample Collection Periods for Groundwater Quality Monitoring at SNL/NM from January 2009 through December 2009**

Sampling Period	GWPP	CWL	MWL	TA-V	TAG	BSG
Jan 09			√		√	
Feb 09				√		√
Mar 09	√					√
Apr 09		√	√			
May 09				√	√	
Jun 09				√		
Jul 09			√		√	
Aug 09				√	√	
Sep 09				√		√
Oct 09		√	√		√	
Nov 09				√	√	
Dec 09				√		

**NOTES:** GWPP= Groundwater Protection Program  
CWL= Chemical Waste Landfill  
MWL= Mixed Waste Landfill

TA-V= Technical Area V  
TAG= Tijeras Area Groundwater  
BSG= Burn Site Groundwater

VOCs detected above the laboratory MDLs but below reporting limits or practical quantitation limits (PQL). Consequently the concentration values reported by the laboratory are qualified with "J" as estimated concentrations. Chloroform was detected at a concentration of 0.762 µg/L in the sample from TRE-1; toluene was detected in samples from Eubank-1 and SWTA3-MW2 at concentrations of 0.292 and 0.251 µg/L respectively; and vinyl chloride and 1,2,4-trimethylbenzene were detected in the sample from CTF-MW2 at

concentrations of 0.582 and 0.538 µg/L, respectively. In addition, bromodichloromethane, chloroform, dibromochloromethane, and naphthalene were reported as detected by the laboratory; however, subsequent validation review of the data resulted in qualifying the data with "U," indicating that the data are not usable because contaminants were detected in the associated blank samples. The only HE compound detected was hexahydro-trinitro-triazine (RDX). The concentration of RDX detected in the sample from CTF-MW2 was reported at 0.243 µg/L; however,



**TABLE 7-3.** Summary of SNL/NM Groundwater Monitoring Results During CY 2009

		SNL/NM Groundwater Monitoring				
Number of Active Wells Monitored		66				
Number of Analyses Performed		13,942				
Percent of Non-Detected Results		83.51 %				

Analyte	Number of Detects	Number of Non-Detects	Minimum Detected Value	Maximum Detected Value	Mean Detected Value	Standard Deviation for Detected Values	MCL
<i>Summary of Field Water Quality Parameters (units as indicated below)</i>							
Potential of Hydrogen in pH	155	0	6.14	8.23	7.4434	0.3008	NE
Specific Conductivity in $\mu\text{mhos/cm}$	155	0	7.9	4,579	789.2	530	NE
Temperature in $^{\circ}\text{C}$	155	0	11.74	26.32	18.875	2.696	NE
Turbidity in NTU	155	0	0.16	150	2.43	12.68	NE
<i>Detected Organic Compounds in <math>\mu\text{g/L}</math></i>							
Acetone	2	150	3.68	3.74	3.71	0.0424	NE
Butanone, 2-	1	151	1.37	1.37	1.37	N/A	NE
Carbon disulfide	1	151	1.29	1.29	1.29	N/A	NE
Chloroform	11	158	0.272	0.762	0.4499	0.1586	NE
Chloromethane	5	164	0.315	0.466	0.3760	0.0623	NE
Dichloroethane, 1,1-	14	155	0.312	1.14	0.6877	0.2337	NE
Dichloroethene, 1,1-	2	167	0.775	0.776	0.77550	0.000707	7.0
Dichloroethene, cis-1,2-	30	125	0.336	3.25	1.681	0.885	70
(2-Ethylhexyl) phthalate, bis	7	20	2.05	9.82	4.07	2.78	6.0
RDX	1	6	0.243	0.243	0.243	N/A	NE
Tetrachloroethene	9	160	0.536	0.920	0.7746	0.1162	5.0
Toluene	62	108	0.251	1.12	0.4627	0.2293	1,000
Trichloroethene	69	102	0.270	18.3	4.702	5.207	5.0
Trimethylbenzene, 1,2,4-	1	16	0.538	0.538	0.5380	N/A	NE
Vinyl chloride	1	168	0.582	0.582	0.5820	N/A	2.0

Refer to footnotes at end of table.

**TABLE 7-3.** Summary of SNL/NM Groundwater Monitoring Results During CY 2009 (continued)

Analyte	Number of Detects	Number of Non-Detects	Minimum Detected Value	Maximum Detected Value	Mean Detected Value	Standard Deviation for Detected Values	MCL
<i>Detected Metals in mg/L</i>							
Aluminum	39	64	0.0053	0.923	0.1224	0.2073	NE
Antimony	2	117	0.000561	0.00085	0.000705	0.000204	0.006
Arsenic	20	99	0.00167	0.0517	0.00480	0.01105	0.010
Barium	119	0	0.0112	0.217	0.08419	0.03573	2.0
Beryllium	3	116	0.00018	0.00733	0.00320	0.00370	0.004
Cadmium	21	98	0.000111	0.00277	0.000476	0.000767	0.005
Calcium	103	0	33.3	384	80.68	54.82	NE
Chromium	15	112	0.00176	0.0211	0.00567	0.00582	0.100
Cobalt	93	26	0.000102	0.011	0.000474	0.001414	NE
Copper	77	42	0.000372	0.0068	0.001229	0.001008	NE
Iron	116	3	0.103	11.9	0.407	1.108	NE
Lead	1	118	0.0005	0.0005	0.00050	N/A	NE
Magnesium	103	0	3.56	69.2	20.53	10.60	NE
Manganese	50	53	0.0011	2.45	0.0942	0.4102	NE
Nickel	119	0	0.00065	0.456	0.00877	0.04607	NE
Potassium	103	0	1.65	42.8	4.747	5.002	NE
Selenium	79	40	0.0010	0.0255	0.003601	0.004333	0.050
Silver	2	117	0.000201	0.000479	0.000340	0.000197	NE
Sodium	103	0	17.4	1,070	65.3	117.3	NE
Thallium	12	107	0.000347	0.00148	0.000516	0.000318	0.002
Tin	3	13	0.00233	0.00944	0.00480	0.00402	NE
Uranium	107	0	0.000286	0.0278	0.006914	0.004356	0.030
Vanadium	33	86	0.0034	0.0405	0.00781	0.00769	NE
Zinc	56	63	0.00262	0.080	0.01303	0.01808	NE

Refer to footnotes at end of table.

**TABLE 7-3.** Summary of SNL/NM Groundwater Monitoring Results During CY 2009 (concluded)

Analyte	Number of Detects	Number of Non-Detects	Minimum Detected Value	Maximum Detected Value	Mean Detected Value	Standard Deviation for Detected Values	MCL
<b>Detected Inorganic Parameters in mg/L</b>							
Nitrate plus nitrite as N	162	3	0.099	39.9	7.260	7.400	10
Bromide	79	1	0.103	2.34	0.5399	0.4855	NE
Chloride	80	0	8.78	447	60.37	71.19	NE
Fluoride	80	0	0.225	2.69	0.9166	0.5243	4.0
Sulfate	80	0	14.0	1,960	105	232.2	NE
Total Organic Halogens	3	14	0.0105	0.0422	0.02830	0.01621	NE
Total phenols	5	12	0.00781	0.0164	0.01070	0.00347	NE
Perchlorate	3	24	4.12	7.24	5.357	1.657	NE
Alkalinity as CaCO <sub>3</sub>	40	0	105	1,500	287.8	246.8	NE
<b>Detected Radiochemistry Activities in pCi/L</b>							
Alpha, gross (uncorrected)	81	3	1.81	49.6	10.67	9.15	15.0
Beta, gross	69	11	1.84	61.8	7.344	7.762	4 mrem/yr
Potassium-40	5	65	53.4	93.8	66.86	16.47	NE
Radium-226	5	12	0.331	2.99	1.127	1.059	5.0
Radium-228	12	5	0.390	7.68	1.313	2.028	5.0

**NOTES:** CaCO<sub>3</sub> = calcium as carbon dioxide

MCL = Maximum contaminant level. Established by the U.S. Environmental Protection Agency Primary Water Regulations (40 CFR 141.11(b)), and subsequent amendments or the New Mexico Environmental Improvement Board in Title 20, Chapter 7, Part 1 of the New Mexico

Administrative Code (20 NMAC 7.10)

mg/L = milligrams per liter

N/A = not applicable

NTU = nephelometric turbidity units

µg/L = micrograms per liter

°C = degrees Celsius

pH = potential of hydrogen (negative logarithm of the hydrogen ion concentration)

uncorrected = gross alpha results reported as uncorrected values (result includes the uranium and radon activities)

4 mrem/yr = any combination of beta and/or gamma emitting radionuclides (as dose rate)

N = nitrogen

NE = not established

pCi/L = picocuries per liter

µmho/cm = micromhos per centimeter

% = percent

**TABLE 7-4.** Summary of Exceedances at Sampling Wells – January through December 2009

Analyte	Well	Exceedance	Date
<b>ARSENIC</b> MCL = 0.010 mg/L	CTF-MW2	0.0517 mg/L	March 2009
<b>BERYLLIUM</b> MCL = 0.004 mg/L	Coyote Springs	0.00733 mg/L	March 2009
<b>FLUORIDE</b> MAC = 1.6 mg/L	SFR-4T	2.69 mg/L	March 2009
	SWTA3-MW4	1.71 mg/L	March 2009
	CTF-MW3	2.52 mg/L	March 2009
	COYOTE SPRINGS	1.68 mg/L	March 2009
	CTF-MW2	1.99 mg/L	March 2009
	CYN-MW1D	1.74 mg/L	September 2009
<b>NITRATE PLUS NITRITE (AS NITROGEN)</b> MCL = 10.0 mg/L	CYN-MW6 (Duplicate)	39.9 mg/L	September 2009
	CYN-MW6	39.4 mg/L	September 2009
	CYN-MW6	37.4 mg/L	March 2009
	TJA-4	29.4 mg/L	August 2009
	TJA-4	27.9 mg/L	November 2009
	TJA-4	27.0 mg/L	January 2009
	TJA-4	26.5 mg/L	May 2009
	TJA-7	25.5 mg/L	August 2009
	TJA-7	24.4 mg/L	May 2009
	TJA-7	23.4 mg/L	November 2009
	TJA-7	23.1 mg/L	January 2009
	TA2-SW1-320	22.1 mg/L	November 2009
	TA2-SW1-320	21.8 mg/L	May 2009
	TA2-SW1-320	21.1 mg/L	January 2009
	TA2-SW1-320	20.2 mg/L	August 2009
	LWDS-MW1	12.8 mg/L	June 2009
	AVN-1	11.8 mg/L	June 2009
	LWDS-MW1	11.2 mg/L	February 2009
	LWDS-MW1	11.2 mg/L	September 2009
	LWDS-MW1 (Duplicate)	11.2 mg/L	September 2009
	TA2-W-19	11.2 mg/L	August 2009
	TJA-2	11.1 mg/L	May 2009
	CYN-MW3	11.0 mg/L	February 2009
	CYN-MW3	10.7 mg/L	September 2009
	CYN-MW3 (Duplicate)	10.7 mg/L	September 2009
	TAV-MW10	10.7 mg/L	June 2009
	TJA-2	10.7 mg/L	August 2009
	TJA-2	10.6 mg/L	November 2009
	LWDS-MW1	10.3 mg/L	December 2009
	TA2-W-19 (Duplicate)	10.3 mg/L	May 2009
	LWDS-MW1 (Duplicate)	10.2 mg/L	December 2009
	TA2-W-19	10.2 mg/L	May 2009
	TAV-MW10	10.2 mg/L	September 2009
	TJA-2	10.1 mg/L	January 2009
<b>TRICHLOROETHENE</b> MCL = 5.0 µg/L	LWDS-MW1	18.3 µg/L	June 2009
	LWDS-MW1	15.7 µg/L	December 2009
	TAV-MW10	15.2 µg/L	June 2009
	LWDS-MW1 (Duplicate)	14.8 µg/L	December 2009
	TAV-MW10	14.1 µg/L	December 2009
	LWDS-MW1	13.8 µg/L	February 2009
	LWDS-MW1	13.5 µg/L	September 2009
	TAV-MW10	13.5 µg/L	February 2009
	LWDS-MW1 (Duplicate)	13.4 µg/L	September 2009
	TAV-MW6 (Duplicate)	13.2 µg/L	June 2009
	TAV-MW10	13.0 µg/L	September 2009
	TAV-MW6	12.7 µg/L	June 2009
	TAV-MW6	11.9 µg/L	December 2009
	TAV-MW6	10.6 µg/L	February 2009
	TAV-MW6	10.5 µg/L	September 2009
	WYO-4	8.55 µg/L	May 2009
	WYO-4 (Duplicate)	8.54 µg/L	May 2009

See end of table for footnotes, next page.

**TABLE 7-4.** Summary of Exceedances at Sampling Wells – January through December 2009 (concluded)

Analyte	Well	Exceedance	Date
<b>TRICHLOROETHENE</b> MCL = 5.0 µg/L (continued)	WYO-4	7.93 µg/L	January 2009
	WYO-4	6.77 µg/L	August 2009
	WYO-4	6.74 µg/L	November 2009
	TA2-W-19	5.10 µg/L	November 2009
	TA2-W-19	5.03 µg/L	January 2009
<b>bis(2-ETHYLHEXYL) PHTHALATE</b> MCL = 6.0 µg/L	MWL-MW7	9.82 µg/L	July 2009
<b>GROSS ALPHA*</b> (uncorrected) MCL = 15.0 pCi/L	CYN-MW4	49.6 pCi/L	September 2009
	CTF-MW2	35.8 pCi/L	March 2009
	CTF-MW1	35.5 pCi/L	March 2009
	GREYSTONE-MW2	34.6 pCi/L	March 2009
	TRE-1	33.9 pCi/L	March 2009
	SFR-2S	32.9 pCi/L	March 2009
	CYN-MW8	30.1 pCi/L	September 2009
	CYN-MW7	26.4 pCi/L	September 2009
	SFR-4T	19.2 pCi/L	March 2009
	MWL-MW5	15.9 pCi/L	April 2009
	CTF-MW3	15.2 pCi/L	March 2009
	COYOTE SPRING	15.1 pCi/L	March 2009
<b>RADIUM-226/228</b> MCL = 5.0 pCi/L	CTF-MW2	10.67 pCi/L	March 2009

**NOTES:** mg/L= milligrams per liter  
µg/L= micrograms per liter  
pCi/L= picocuries per liter  
MAC= maximum allowable concentration  
MCL= maximum contaminant level  
\*Gross alpha results reported as uncorrected values (result includes the uranium and radon activities).

this value was also qualified as estimated with “J” as detected but not reliably quantifiable.

#### Non-metal Inorganic Compounds and Phenolics

Non-metallic inorganic constituents analyzed in groundwater samples included phenolics and TOX, total cyanide, alkalinity, and ions (including bromide, chloride, fluoride, sulfate, and NPN (reported as nitrogen)).

None of the analytes listed were detected above MCLs or MACs, except fluoride. Fluoride was detected above the MAC of 1.6 milligrams per liter (mg/L) in samples from Coyote Springs, CTF-MW2, CTF-MW3 (primary and duplicate), SFR-4T, and SWTA3-MW4 at concentrations ranging from 1.68 to 2.69 mg/L. Elevated fluoride concentrations are routinely observed in monitoring wells in the eastern half of KAFB. This is an area of shallow groundwater and elevated bedrock containing fluoride-bearing minerals. The time trend plots for wells exceeding the MCL for fluoride concentrations are presented in Figures B-1 through B-5 (Appendix B). The results for TOX were qualified during data validation as not detected in various samples due to contamination in initial calibration and continuing calibration blank samples. NPN (reported as nitrogen) results for the

Coyote Springs samples and total phenols results for both SFR-4T and SWTA3-MW2 samples were qualified as not detected during the data validation process due to associated laboratory method blank contamination.

#### Metals

The analyses were conducted for dissolved metals on filtered groundwater samples, except for mercury. The total concentration of mercury was determined in an unfiltered aliquot of sampled groundwater. The groundwater standards of the NMWQCC are based on dissolved concentrations. Dissolved metals usually occur as natural trace concentrations and are generally below regulatory limits.

No metal analytes, other than arsenic and beryllium, were detected above regulatory limits in any groundwater sample. Arsenic was detected above the MCL of 0.01 mg/L in the sample from CTF-MW2 at a concentration of 0.0517 mg/L. The time trend plot for arsenic concentrations in well CTF-MW2 is shown in Figure B-6 (Appendix B). Beryllium was detected above the MCL of 0.004 mg/L in the sample from Coyote Springs at a concentration of 0.00733 mg/L. The time trend plot for beryllium concentrations in Coyote Springs is shown in Figure B-7 (Appendix B).



Mercury was analyzed from unfiltered samples and reported as total mercury. Mercury was not detected above associated laboratory MDLs in any groundwater sample.

#### Radionuclide Activity

Analyses for radioisotopes were conducted on all samples. Specific analyses included gamma spectroscopy, gross alpha/beta, radium-226 and radium-228.

All isotope activities determined by gamma spectroscopy are less than associated MDA values, except for potassium-40. Potassium-40 was reported above the MDA in the sample from CTF-MW3 at an activity of  $53.4 \pm 48.8$  picocuries/liter (pCi/L). Potassium-40 results for the sample from Coyote Springs and samples from SFR-4T and SWTA3-MW3 were qualified as unusable during data validation due to the gamma spectrum peak not meeting identification criteria for the isotope.

Radioisotopic analyses included gross alpha and gross beta activity, radium-226, and radium-228. Gross alpha activity results for samples from Coyote Springs, CTF-MW1, CTF-MW2, CTF-MW3, Greystone-MW2, SFR-2S, SFR-4T, and TRE-1 exceeded the MCL of 15 pCi/L at activity levels ranging from 15.1 to 35.8 pCi/L. A reanalysis of the results for Greystone-MW2 and SFR-4T was conducted because the original results differed significantly from the historical gross-alpha data available for these locations. On reanalysis, the gross alpha activity results for these wells were below 15 pCi/L. In the general location of these wells in the eastern portion of KAFB, groundwater is in contact with bedrock that contains minerals high in naturally occurring uranium and other naturally occurring radionuclides. Gross alpha activity results are reported as uncorrected gross alpha activity (not corrected by subtracting naturally occurring uranium and radon activity). When the correction for the gross-alpha contribution from uranium is subtracted using a specific activity of 670 picocuries per milligram (pCi/mg) *National Primary Drinking Water Regulations, Radionuclides: Final Rule* (EPA 2000), the results for samples from CTF-MW1, CTF-MW2, SFR-2S, and TRE-1 are 27.0, 17.2, 21.9, and 21.9 pCi/L, respectively.

Additional corrections for radon activity can be applied to these numbers; however, radon is not one of the analytes available for groundwater samples

from these wells. Trend plots for those wells in which corrected alpha activity results exceed the MCL are shown in Figures B-8 through B-10 (Appendix B). Combined radium-226 and radium-228 activity results from the CTF-MW2 sample exceed the MCL of 5.0 pCi/L. Radium-226 was reported in the sample from CTF-MW2 at 2.99 pCi/L, and radium-228 at 7.68 pCi/L. Gross beta activity results do not exceed established limits.

## **7.2.2 ER Project Water Quality Results**

### ***CWL Results***

Groundwater monitoring at CWL was performed during April and October 2009. Groundwater samples were collected from monitoring wells CWL-MW2BL, CWL-MW4, CWL-MW5L, CWL-MW5U, CWL-MW6L, and CWL-MW6U. These samples were analyzed for the required 40 CFR 264 (Appendix IX) constituents: VOC, semi-volatile organic compounds (SVOC), chlorinated herbicides, polychlorinated biphenyls (PCB), total cyanide, sulfides, dissolved chromium, and total metals plus iron. The NMED Department of Energy (DOE) Oversight Bureau (OB) participated in both April and October 2009 sampling events and received split samples from four CWL monitoring wells (CWL-MW2BL, CWL-MW4, CWL-MW5L, and CWL-MW6L). The split samples were sent to a different laboratory for analysis of various Appendix IX constituents as determined by the NMED DOE OB. Additional samples for total uranium and PCB congeners were requested by the NMED DOE OB at the four CWL wells. To ensure a consistent level of quality assurance for these analyses, SNL/NM also collected samples for total uranium and PCB congeners at these four CWL monitoring wells. These additional analyses are not required by Appendix G of the *CWL Closure Plan* (SNL 1992). The NMED DOE OB split samples with Sandia, which are presented in a separate report. Sample results were compared with MCLs, where established. Water quality parameters for specific conductivity, oxidation-reduction, pH, turbidity, and dissolved oxygen were measured prior to sampling each well.

#### VOC, SVOC, Chlorinated Herbicides, and PCB

No VOCs, SVOCs, chlorinated herbicides, or PCBs were detected above established MCLs during CY 2009. No VOCs were detected in any sample except for acetone, chloroform, toluene, and TCE. Acetone and chloroform were detected below the laboratory practical quantitation limits.

Toluene was detected below the MCL of 1,000 µg/L at concentrations ranging from 0.307 µg/L to 1.12 µg/L. TCE was detected below the MCL of 5.0 µg/L at concentrations ranging from 0.270 µg/L to 2.58 µg/L. No SVOCs were detected above laboratory MDLs, except bis(2-Ethylhexyl) phthalate. This compound was detected below the MCL of 6.0 µg/L. No herbicides or PCBs were detected above laboratory MDLs. Additional samples were collected for PCB congeners at CWL-MW2BL, CWL-MW4, CWL-MW5L, and CWL-MW6L to duplicate the analyses performed by the NMED DOE OB. No PCB congeners were detected above laboratory PQLs from groundwater samples collected at these four CWL monitoring wells.

#### Total Cyanide, Sulfide, and Dissolved Chromium

Total cyanide, sulfide, and dissolved chromium were not detected above the laboratory MDLs in any CWL groundwater sample.

#### Metals

As required by the NMED Hazardous Waste Bureau (HWB), all metal samples were analyzed for total metals. No total metal parameters were detected above established regulatory limits in any groundwater sample. Chromium was detected below the MCL of 0.10 mg/L at concentrations ranging from 0.00211 mg/L to 0.0151 mg/L. Nickel was detected above the laboratory MDL in all environmental groundwater samples. Detected nickel concentrations ranged from 0.00147 mg/L to 0.456 mg/L. There is not an established MCL for nickel. Additional samples were collected for total uranium at CWL-MW2BL, CWL-MW4, CWL-MW5L, and CWL-MW6L to duplicate the analyses performed by the NMED DOE OB. Uranium was reported below the MCL of 0.03 mg/L, at concentrations ranging from 0.0131 mg/L at CWL-MW4 to 0.0163 mg/L at CWL-MW2BL.

#### ***MWL Results***

Groundwater sampling of seven monitoring wells at the MWL was conducted in January 2009, April 2009, July 2009, and October 2009. Groundwater samples were analyzed for VOCs, SVOCs, TAL metals and total uranium, NPN (reported as nitrogen), anions, tritium, gross alpha/beta radioactivity, gamma-emitting radionuclides, manganese II, total organic carbon (TOC), carbon dioxide, total dissolved solids (TDS), ferrous iron, and biological oxygen demand (BOD).

The COOC (NMED 2004) requires that new wells be sampled for perchlorate for a minimum of four quarters. In CY 2009, the groundwater monitoring wells installed in 2008 (MWL-MW7, MWL-MW8, MWL-MW9, and MWL-BW2), were still part of the perchlorate screening monitoring well network.

Sampling results were compared with MCLs, where established. Water quality parameters were measured at the time of sample collection at each well.

#### VOC Analyses

Groundwater samples from the MWL monitoring wells had detections of acetone and toluene below the MCL (the MCL for toluene is 1,000 µg/L; no MCL exists for acetone). Neither compound is a COC at the MWL, though historically, toluene has been detected in MWL groundwater samples. The maximum acetone concentration was 4.42 µg/L in a sample in MWL-MW8. The maximum toluene concentration was 0.892 µg/L in MWL-MW9. All detected acetone and toluene were qualified as estimated values because the concentrations were detected below the effective laboratory PQL.

#### Metals

Groundwater samples collected during the groundwater sampling at the MWL were analyzed for filtered and unfiltered TAL metals and total uranium. No metals or uranium were detected in the filtered or unfiltered samples above their respective MCLs.

#### Radionuclide Activity

Groundwater samples from the MWL monitoring wells were analyzed for gamma-emitting radionuclides, gross alpha/beta activity, and tritium and compared with the established EPA MCLs (no MCLs have been established for tritium). No tritium or gamma-emitting isotopes were detected above their respective MDAs in any of the groundwater samples.

Gross alpha/beta activity levels were detected above laboratory reporting limits in all environmental samples. The maximum gross alpha activity was  $15.9 \pm 4.12$  pCi/L in MWL-MW5 during the April 2009 sampling event. When the gross alpha data is corrected for the uranium activity contribution, this sample does not exceed the MCL of 15 pCi/L. The trend plot for MWL-MW5 is shown in Figure B-11. Gross beta activity levels were below MCLs.

### Inorganic Chemical Analyses

Among the inorganic analytes (NPN [reported as nitrogen], perchlorate, bromide, fluoride, chloride, sulfate) only fluoride and NPN have an MCL or MAC. Fluoride concentrations did not exceed the MAC of 1.6 mg/L, which is the lower of the two regulatory limits. Perchlorate concentrations in MWL-MW7, MWL-MW8, and MWL-MW9 did not exceed the 0.004 mg/L screening level established in the COOC. NPN (reported as nitrogen) concentrations did not exceed the MCL of 10 mg/L in any sample from any sampling event during CY 2009.

### ***TA-V Results***

Quarterly groundwater sampling at TA-V was performed in February 2009, May/June 2009, August/September 2009, and November/December 2009.

### Analytes Sampled

Quarterly groundwater samples were analyzed for VOCs and NPN (reported as nitrogen). In addition to the quarterly analytes, analyses for anions, TAL metals and total uranium, tritium, gross alpha/beta, and selected radionuclides by gamma spectroscopy were conducted on samples during the August/September 2009 sampling event. Also, perchlorate was analyzed for samples collected from LWDS-MW1 during the May/June 2009, August/September 2009, and November/December 2009 sampling events. Field water quality measurements were taken at each well prior to sample collection.

### VOC Analyses

TCE concentrations in excess of the MCL of 5 µg/L were detected in samples from TA-V monitoring wells LWDS-MW1, TAV-MW6, and TAV-MW10 (see Table 7-4). The maximum concentration detected was 18.3 µg/L in LWDS-MW1 in June 2009. The maximum concentration detected in TAV-MW6 was 13.2 µg/L in June 2009, and the maximum concentration detected in TAV-MW10 was 15.2 µg/L in June 2009. The TCE concentration trends for LWDS-MW1 and TAV-MW6 are shown in Figures B-12 and B-13. TAV-MW10 was installed to replace TAV-MW1 and the TCE concentrations for these two wells appear to be increasing over time (see Figure B-14). No other VOCs were detected above MCLs in any other monitoring well.

### Inorganic Chemical Analyses

Among the inorganic analytes [NPN (reported as nitrogen), bromide, chloride, fluoride, and sulfate], only fluoride and NPN have an MCL or MAC. Fluoride concentrations did not exceed the MAC of 1.6 mg/L, which is the lower of the two regulatory limits. Perchlorate concentrations in LWDS-MW1 did not exceed the 0.004 mg/L screening level established in the COOC. NPN (reported as nitrogen) concentrations exceeded the MCL of 10 mg/L in LWDS-MW1 during all CY 2009 sampling events, with a maximum concentration of 12.8 mg/L in June 2009 (Table 7-4). The nitrate in LWDS-MW1 has consistently exceeded the MCL over the past six years, however, the concentrations appear to be constant to slightly decreasing over time (Figure B-15). The nitrate concentrations in TAV-MW10 exceeded the MCL during two sampling events. TAV-MW10 was installed to replace TAV-MW1 and the nitrate concentrations for these two wells appear to be increasing over time (Figure B-16). Until June 2009, the NPN (reported as nitrogen) concentration at AVN-1 had never exceeded the MCL. Due to the concentration of 11.8 mg/L exceeding the MCL, the sample was re-analyzed and a concentration of 8.60 mg/L was reported. Figure B-17 shows that NPN concentrations in AVN-1 are relatively stable over time.

### Metals

Total metal analyses were conducted on the groundwater samples collected from all wells during the August/September 2009 sampling event. No metal concentrations exceeded established MCLs.

### Radionuclide Activity

Gamma spectroscopy, gross alpha/beta, and tritium analyses were conducted on all wells during the August/September 2009 sampling event. All radionuclide activities were below MCLs, where established. Tritium, analyzed by EPA Method 906.0M, was not detected above the MDA in any of the wells.

### ***TAG Results***

Groundwater sampling at TAG was performed in January 2009, May 2009, July/August 2009, and October/November 2009. Samples were collected from 21 wells — 11 perched groundwater system wells, and 10 regional aquifer wells. Samples collected quarterly, semiannually, and annually were analyzed for NPN (reported as nitrogen) and VOCs.

Additional analyses including TAL metals, tritium, gross alpha/beta, and selected radionuclides by gamma spectroscopy were conducted during the July/August 2009 sampling event. Also, perchlorate was analyzed for samples collected from TA1-W-06, TA1-W-08, TA2-W-01, and TA2-W-27 during the July/August 2009 and October/November 2009 sampling events. Field water quality measurements were taken at each well prior to sample collection.

#### VOC Analyses

TCE concentrations above the MCL of 5 µg/L were detected in groundwater samples from two perched groundwater system wells, WYO-4 and TA2-W-19 (Table 7-4). WYO-4 had concentrations of TCE exceeding the MCL in all sampling events, with a maximum TCE concentration of 8.55 µg/L in May 2009 (see Figure B-15). TA2-W-19 had a maximum concentration of 5.10 µg/L in November 2009 (see Figure B-18).

#### Inorganic Chemical Analyses

Inorganic chemical analyses of quarterly groundwater samples consisted of NPN (reported as nitrogen). Nitrate exceeded the MCL in four wells during all sampling events: TA2-SW1-320, TJA-2, TJA-4, and TJA-7 (Table 7-4). Nitrate concentrations exceeded the MCL in TA2-W-19 during two sampling events (May 2009 and August 2009) (Table 7-4). The maximum concentration in the study area was reported for TJA-4 at 29.4 mg/L in August 2009. Figures B-19 through B-23 show that nitrate concentrations in these five wells range from slightly increasing to slightly decreasing over time. Perchlorate concentrations in TA1-W-06, TA1-W-08, TA2-W-01, and TA2-W-27 did not exceed the 0.004 mg/L screening level established in the COOC.

#### Metals

Total metals analyses were performed on the samples collected during the July/August 2009 sampling event. The results were all below the respective MCLs, where established.

#### Radionuclide Activity

Gamma spectroscopy, gross alpha/beta, and tritium analyses were conducted on 21 wells during the July/August 2009 sampling event. All radionuclide activities were below MCLs, where established. Tritium, analyzed by EPA Method 906.0M, was not detected above the MDA in any of the wells.

### ***BSG Results***

Groundwater sampling at the BSG was performed in February/March 2009 and September 2009 on six wells located in Lurance Canyon near the SNL/NM Burn Site Facility. The samples were analyzed for VOCs, diesel-range organics, gasoline-range organics, anions, NPN (reported as nitrogen), TAL metals (plus uranium), gross alpha/beta, tritium, and radionuclides by gamma spectroscopy. Per the requirements of the COOC, sampling for perchlorate was conducted at CYN-MW6. Field water quality measurements were taken at each well prior to sample collection.

#### VOCs and Other Organic Compounds

No VOCs were detected above MCLs. No detections of diesel-range organics or gasoline-range organics were reported for any CY 2009 sampling events.

#### Major and Minor Anions

NPN (reported as nitrogen) results exceeded the MCL of 10 mg/L in samples from CYN-MW3 and CYN-MW6 during all sampling events, with a maximum 39.9 mg/L during the September 2009 sampling event (see Table 7-4). Nitrate concentrations in this well have consistently exceeded the MCL (see Figure B-24). NPN (reported as nitrogen) concentrations in CYN-MW3 had a maximum concentration of 11.0 mg/L during the February 2009 sampling event (Table 7-4). Nitrate concentrations are relatively stable over time in CYN-MW3 (Figure B-25).

Perchlorate concentrations in CYN-MW6 exceeded the 0.004 mg/L screening level established in the COOC. The maximum concentration of 0.00724 mg/L was detected during the March 2009 sampling event. No MCL or MAC currently exists for perchlorate, although the NMED identifies perchlorate as a potential toxic pollutant. All other inorganic chemical analytical results were below established MCLs.

#### Metals

No metal concentrations above MCLs were detected in any of the wells sampled during the September 2008 sampling event.

#### Radionuclide Activity

Groundwater samples were analyzed for gross alpha/beta, tritium, and gamma spectroscopy. All radionuclide activities were below MCLs, except for gross alpha in CYN-MW4, CYN-MW7, and



CYN-MW8. Uncorrected gross alpha values from CYN-MW4, CYN-MW7, and CYN-MW8 exceeded the MCL of 15 pCi/L at activities ranging from  $26.4 \pm 9.48$  pCi/L to  $49.6 \pm 15.5$  pCi/L. Gross alpha trend data for these wells is shown in Figures B-26 through B-29, respectively. In this region, groundwater contacts bedrock which contains minerals that are high in naturally occurring uranium. Gross alpha results are consistent with historical results in Burn Site monitoring wells and are reported as uncorrected gross alpha activities (not corrected by subtracting naturally occurring uranium or radium activities). Gamma spectroscopy analysis did not detect any isotopes above associated MDAs. Tritium, analyzed by EPA Method 906.0M, was not detected above the MDA in any of the six samples.

## 7.3 Water Levels

Water levels are a means to assess the physical changes of the groundwater system over time. This includes changes in the local water table, the quantity of water available, as well as the direction and speed of groundwater movement. The GWPP gathers groundwater level measurements from a large network of wells on and around KAFB. In addition to wells owned by the DOE National Nuclear Security Administration (NNSA), Sandia Site Office (SSO), data is solicited for U.S. Air Force (USAF) IRP, ABCWUA, and USGS wells. In 2009, data from 156 wells were incorporated into the monitor well water level database. Water levels were measured monthly or quarterly.

### 7.3.1 Regional Hydrology

#### *Groundwater Conceptual Model*

A brief overview of the regional hydrology is given in Chapter 1, Section 1.5 of this report. Although water levels may fluctuate locally over the course of the year in response to seasonal recharge and groundwater withdrawal, the overall level of the regional aquifer within the basin continues to decline. The regional aquifer which underlies the western part of KAFB is comprised of the saturated coarse-to-fine grained strata of the upper and middle units of the Santa Fe Group. Most of the ABCWUA and KAFB water supply wells are completed in this aquifer. Groundwater withdrawal at these wells is manifested as declining water levels throughout the region.

The regional water table in the KAFB area can be subdivided into three general areas:

Groundwater levels east of the Tijeras Fault Complex are approximately 100 to 150 feet (ft) below the surface. Groundwater levels west of the Tijeras Fault Complex and the Sandia Fault are approximately 500 ft or more below ground surface (bgs). This area is part of the regional Albuquerque Basin aquifer system.

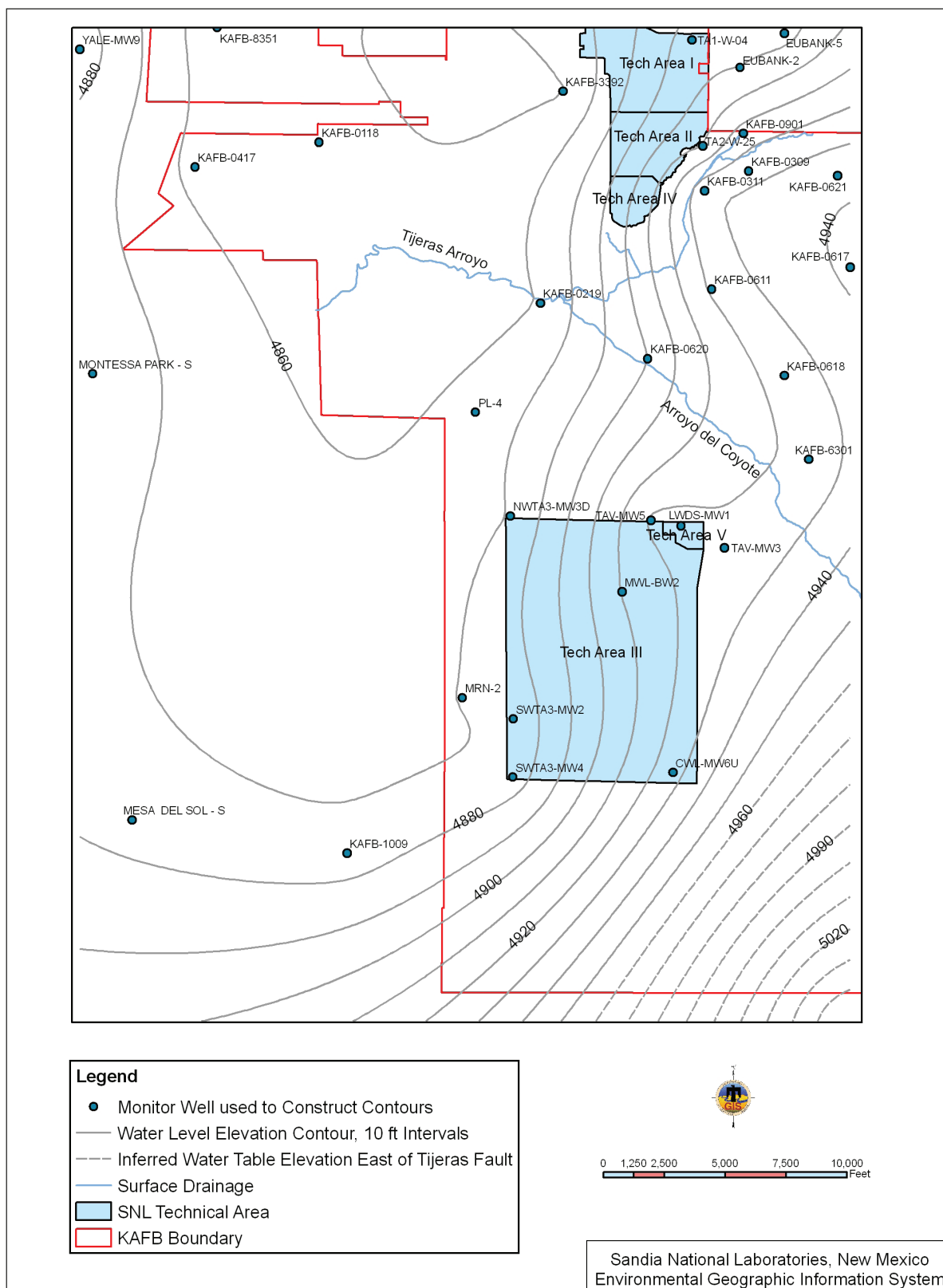
Between the east and west areas is a transition zone comprised of the fault complex. The aquifer system within the fault complex is not well documented. This is due to the complex geology of the area and the limited number of wells available to characterize the system.

#### *Regional Groundwater Table*

The 2009 Regional Groundwater Elevation Contour map for SNL/KAFB is presented in Figure 7-3. The extent of the contoured map area was constructed using static water level data from 33 wells west of the Tijeras Fault Complex. This map represents the water table in the time period spanning September through November 2009. The three month window is necessary because some wells are only monitored quarterly. Generally, these monitor wells are screened across the regional water table in the upper unit of the Santa Fe Group. They penetrate different depths into the aquifer and have various lengths of screened intervals. Although most of the water level data represent an unconfined water table, some water levels may represent semi-confined conditions.

The contour lines shown in Figure 7-3 represent lines of equal elevation of the groundwater table. Groundwater withdrawal as a consequence of pumping by KAFB production wells at the northern part of the KAFB and nearby ABCWUA production wells has created a depression in the regional water table. This “U” shaped depression, with the top of the “U” pointing north, extends south to Isleta Pueblo, and is a result of preferential flow through highly conductive ancestral Rio Grande fluvial deposits, which are the primary aquifer material in this area. Groundwater flow is perpendicular to the contour lines in the direction of decreasing elevation. The direction of groundwater flow within the region is toward the production wells. This pumping-induced flow to the north is in contrast with the southwesterly flow direction reported in 1961 at a time of significantly lower groundwater withdrawal (Bjorklund and Maxwell 1961).





**FIGURE 7-3.** 2009 Regional Groundwater System Water Table Elevation

### ***Perched Groundwater System (PGS)***

A subset of monitor wells are completed in a PGS between ground level and the regional water table. This PGS is limited to the northern part of KAFB in the vicinity of SNL/NM's TA -I, -II, and -III, extending southwest to the location of the former KAFB sewage lagoons. The eastward extent of the PGS wells extends to under the KAFB Landfill and southeast to the KAFB Golf Course. The elevation data of the first saturated water interval in the PGS wells are illustrated in Figure 7-4. The figure was constructed from water level elevation data for 19 wells completed in the PGS. The contours indicate a gradient to the east-southeast. The highest elevation contour, near the western edge of the PGS, near the former KAFB sewage lagoons is at 5,155 feet above sea level (fasl) (KAFB-2622). This elevation corresponds to a depth to water from the surface of approximately 205 ft. At the same location the regional water table is 509 ft bgs or 4854 fasl. Along the eastern boundary of the PGS, the elevation of first water is at 5,023 fasl (KAFB-0315). This elevation is close to the elevation of the regional water table, which is 4,937 fasl (KAFB-0621) at this location. Because of the eastern dip of the PGS wells and the western dip of the regional system, the two systems appear to merge near this location.

### ***Groundwater Recharge and Loss***

The dynamics of water table fluctuations, as reflected by water levels in individual wells, are a balance between groundwater inflow to the basin, recharge, water withdrawal, basin outflow, and the hydrologic properties of the aquifer. Recharge to the groundwater in the Middle Rio Grande Basin occurs primarily through mountain front recharge and infiltration from active arroyos, washes, and rivers within the basin.

Recharge potential for groundwater is directly related to the amount of precipitation. The regional climate for the Albuquerque Basin area is semi-arid, as described in Section 1.6. KAFB water production wells supply most of the water used by SNL/NM and

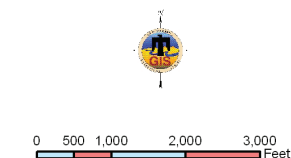
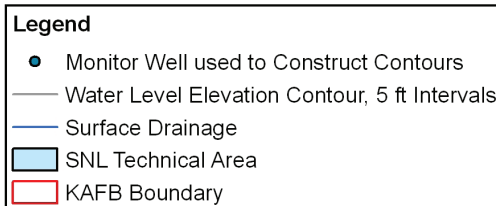
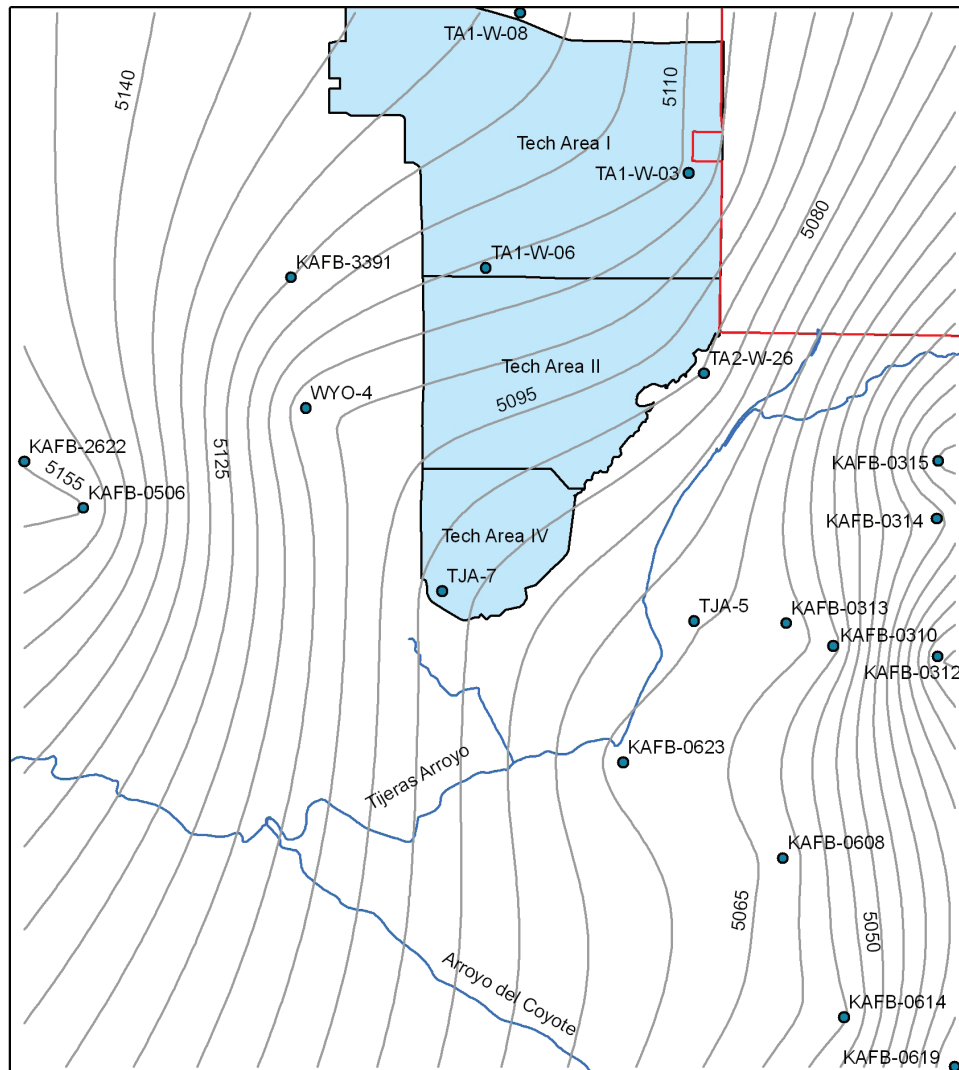
KAFB. KAFB production wells extract groundwater from the upper and middle units of the Santa Fe Group at a depth of up to 1,600 ft. These units constitute the primary aquifer for the Albuquerque metropolitan area. In CY 2009, KAFB pumped approximately 890 million gallons (gal) of groundwater from seven water wells. This represents a decrease of 6 million gal from the previous year.

### ***7.3.2 Groundwater Level Trends***

In 1993, the USGS conducted a study on the Santa Fe Group and the Albuquerque area and found that the quantity of water in the aquifer was significantly less than previously estimated (Thorn et al. 1993). The imbalance between recharge and groundwater withdrawal has resulted in a general decline in water levels. Figure 7-5 shows the contour map of the regional water table elevation changes recorded for the western area of KAFB over the one year period between 2008 and 2009.

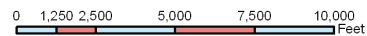
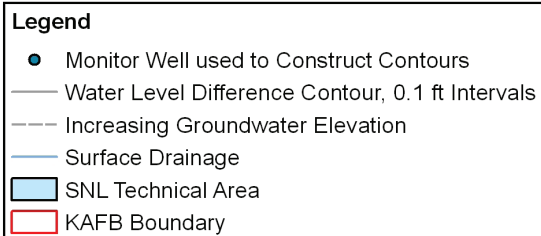
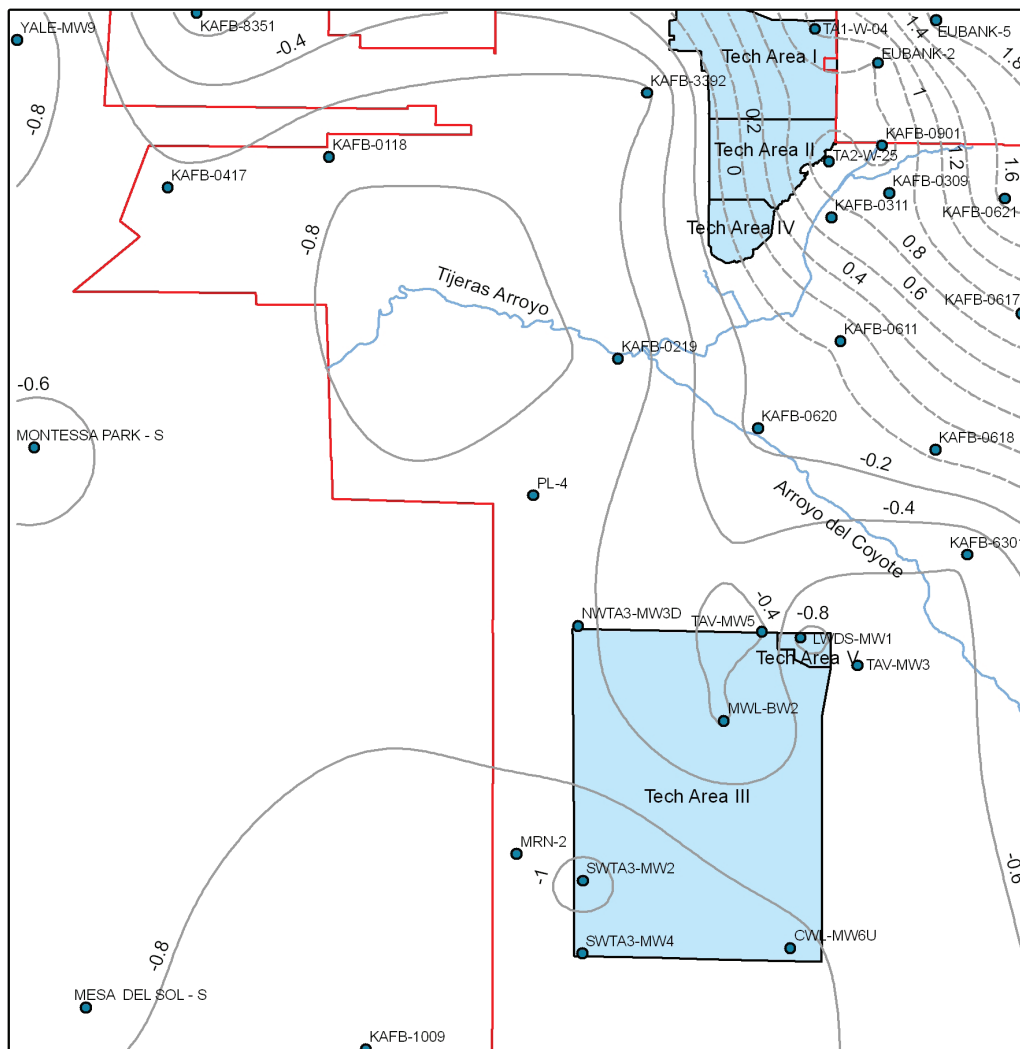
The largest amount of decline over the period is approximately 1.0 ft per year, similar to the rate of decline reported for the previous year. The largest is in the vicinity of the southwestern boundary of TA-III. In the eastern portion of the mapped area, including TA-III, water levels show moderate declines. In contrast to the trend of water level declines throughout most of the region, the water levels in the northeast portion of the mapped area are increasing slightly. This area coincides with a potential recharge area associated with Tijeras Arroyo.

The water level trends for PGS wells indicate a decrease in water level elevations in the western portion of the zone (Figure 7-6). There is a decrease of 0.95 ft in water level elevation measured at the WYO-4 location over the recent year. The water levels in the eastern part appear to be increasing, which is consistent with the notion that the PGS is draining to the east and merging with the regional system.



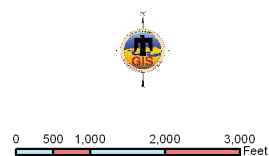
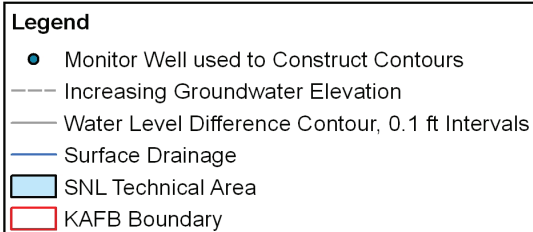
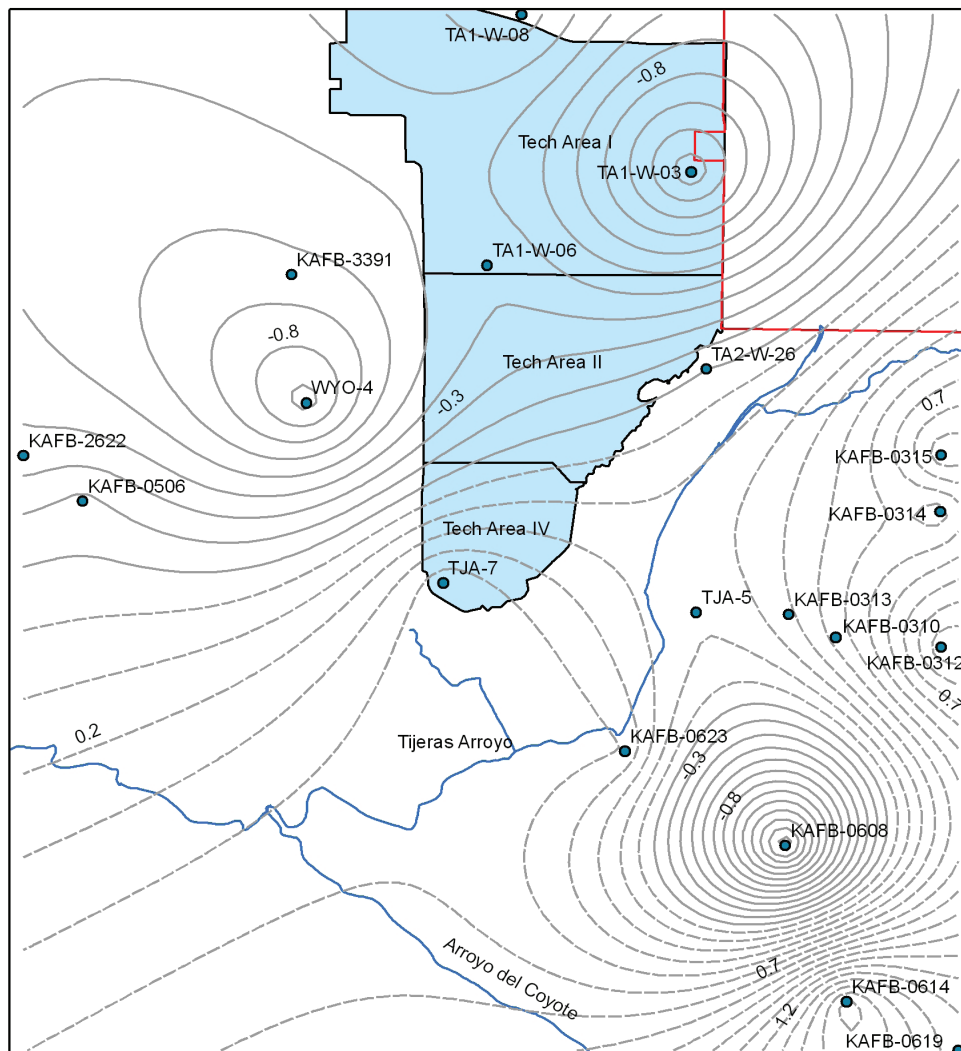
Sandia National Laboratories, New Mexico  
Environmental Geographic Information System

**FIGURE 7-4.** 2009 Perched Groundwater System Water Table Elevation



Sandia National Laboratories, New Mexico  
Environmental Geographic Information System

**FIGURE 7-5.** Change in Regional Groundwater System Water Table Elevation 2008 to 2009



Sandia National Laboratories, New Mexico  
Environmental Geographic Information System

**FIGURE 7-6.** Change in Perched Groundwater System Water Table Elevation 2008 to 2009



# 8.0 Quality Assurance

## 8.1 Corporate Level Quality Assurance (QA)

The Integrated Laboratory Management System (ILMS) is the framework by which Sandia Corporation (Sandia) manages all work done at the Laboratories. It reflects the major functions performed by the Laboratories as well as the management structure and the management information used to actually plan, execute, and monitor our work (see Figure 8-1). ILMS is the means by which Sandia ensures long-term customer confidence by improving management performance and effectiveness, achieving efficiencies to enhance mission work, and satisfying National Nuclear Security Administration (NNSA) and the Department of Energy's (DOE) contractor assurance requirements.

Sandia deploys responsibility and accountability for implementing and putting into action the QA Program elements specified in International Organization for Standardization (ISO) 9001-2000 (IOS 2008), the Contractor Requirements Document of DOE Order 414.1C, *Quality Assurance* (DOE 2005), and regulation 10 Code of Federal Regulations (CFR) 830, Subpart A, *Quality Assurance*, via policy statements, processes, and procedures; and executing the actions specified in those processes and procedures.

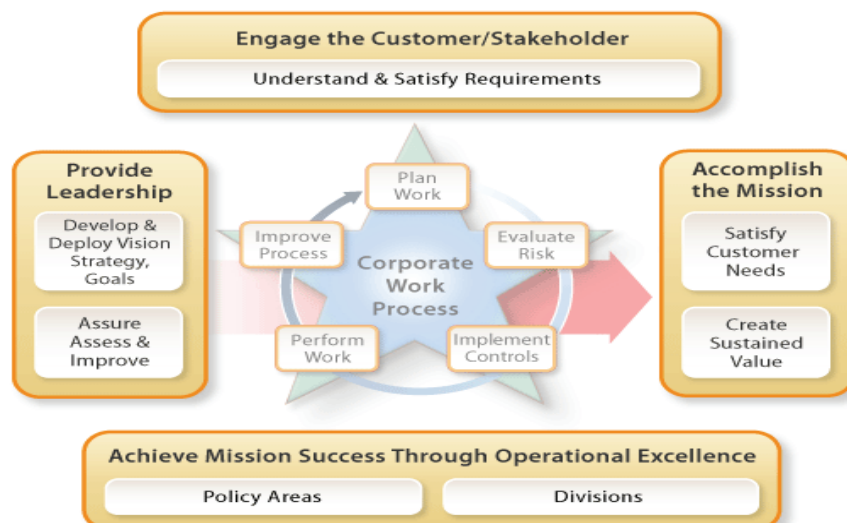
Sandia management is responsible for ensuring the quality of its products and for assessing its operations, programs, projects, and business systems; identifying deficiencies and effecting continuous improvements.

### 8.1.1 Environment, Safety & Health (ES&H) Policy Statement Requirement

Sandia is committed to protecting the environment and to preserving the health and safety of workers and the community. Sandia considers the protection and preservation of the environment and the safety and health of its employees, contractors, visitors, and the public to be critical to its success.

It is the policy of Sandia to protect Members of the Workforce and the public, prevent incidents, integrate environmental stewardship and sustainability throughout the life cycle of its activities and to conserve natural resources and protect the environment.

DOE's Integrated Safety Management System (ISMS) is a key element of Sandia's ILMS. ISMS provides the framework for managing ES&H activities and functions while integrating them into all Sandia operations.



**FIGURE 8-1.** Sandia's Integrated Laboratories Management System (ILMS)  
The Corporate Work Process is illustrated in the five points of the star.

### 8.1.2 ISMS

Sandia's corporate ES&H program mandates compliance with all applicable laws, regulations and DOE directives that are included in the Prime Contract between DOE and Sandia. As appropriate, internal corporate policy and permit requirements are included. Sandia is committed to performing work safely and ensuring protection of the Members of the Workforce, the public, and the environment.

***ES&H performance at Sandia  
is based upon the  
Five Safety Management Core Functions  
and the  
Seven Guiding Principles of ISMS.***

Sandia is committed to environmental protection for current and future generations. This commitment includes identifying and mitigating potential risks to the environment, and incorporating environmental management as an integrated element of all work.

#### ***Environmental Management System (EMS)***

Sandia is committed to integrating environmental protection with its mission and recognizes that the environment must be protected and preserved for current and future generations. Sandia takes this responsibility seriously and expects employees, contractors, and visitors to proactively protect the environment and natural resources. This responsibility includes identifying and mitigating potential risks to the environment and incorporating environmental management in daily work activities.

In compliance with DOE Order 450.1A, *Environmental Protection Program*, Sandia has implemented an EMS as part of the ISMS.

The vision of the Sandia EMS is to implement a system that is a model within the NNSA complex and is consistent with the ISO 14001 Standard. Sandia National Laboratories, New Mexico (SNL/NM) received ISO 14001 certification in 2009.

#### ***Five Core Safety Management Functions of ISMS***

There are five core safety management functions which provide the necessary work control structures,

planning and execution at the activity level to ensure the safety of the Members of the Workforce, the public, and the environment:

1. ***Define the Scope of Work*** – Missions are translated into work, expectations are set, tasks are identified and prioritized, and resources are allocated.
2. ***Analyze the Hazards*** – Hazards and environmental impacts associated with the work are identified, analyzed, categorized, and communicated.
3. ***Develop and Implement Hazard Controls*** – Applicable standards and requirements are identified and agreed upon. Controls to prevent/mitigate hazards and environmental impacts are identified, the safety envelope is established, and controls are implemented.
4. ***Perform Work Within Controls*** – Readiness is confirmed and work is performed safely, and in an environmentally responsible manner.
5. ***Provide Feedback and Continuous Improvement*** – Information and feedback on the adequacy of controls is gathered, opportunities for improving the definition and planning of work are identified and implemented, and line and independent oversight is conducted.

Refer to Figure 8-2 for an illustration of the five core safety management functions of ISMS.

#### ***Seven Guiding Principles of ISMS***

Sandia shall, in the performance of work, ensure implementation of the following Seven Guiding Principles of ISMS:

1. ***Line Management is Responsible for Safety*** – Line management is responsible for the protection of employees, the public, and the environment. Line management includes those contractor and subcontractor employees managing or supervising employees performing work.
2. ***Clear Roles and Responsibilities are Defined*** – Clear and unambiguous line of authority and responsibility for ensuring ES&H is established and maintained at all organizational levels.



FIGURE 8-2. ISMS Star

3. ***Worker Competence Is Commensurate with Responsibilities*** – Personnel possess the experience, knowledge, skills, and abilities that are necessary to discharge their responsibilities.
4. ***Priorities are Balanced*** – Resources are effectively allocated to address ES&H, programmatic, and operational considerations. Protecting employees, the public, and the environment is a priority whenever activities are planned and performed.
5. ***Safety Standards and Requirements are Identified*** – Before work is performed, the associated hazards are evaluated and an agreed-upon set of ES&H standards and requirements are established which, if properly implemented, provide adequate assurance that employees, the public, and the environment are protected from adverse consequences.
6. ***Hazard Controls are Tailored to Work Being Performed*** – Administrative and engineering controls to prevent and mitigate hazards are tailored to the work being performed and associated hazards. Emphasis should be on designing the work and/or controls to reduce or eliminate the hazards and prevent accidents and unplanned releases and exposures.
7. ***Operations Authorization Exists*** – The conditions and requirements to be satisfied for operations to be initiated and conducted are established and agreed-upon by DOE and the contractor. These agreed-upon conditions and requirements are requirements of the contract

and binding upon the contractor. The extent of documentation and level of authority for agreement shall be tailored to the complexity and hazards associated with the work and shall be established in a Safety Management System.

## 8.2 Environmental Program QA

Environmental samples are collected by personnel in various programs and analyzed for radiological and non-radiological contaminants. Some sampling is specifically mandated by regulations to meet compliance, while other sampling activities are carried out in accordance with DOE Orders.

### 8.2.1 Environmental Sampling and Analysis

#### ***Environmental Sampling***

Environmental sampling is conducted in accordance with program-specific Sampling and Analysis Plans (SAP) or Work Plans which contain applicable QA elements. These documents meet appropriate federal, state, and local regulatory guidelines for conducting sampling and analysis activities.

#### ***Program-Specific SAPs***

Each program involved in environmental monitoring and sampling develops and follows a relevant SAP. Project SAPs include critical elements, such as procedures for sample collection, sample preservation and handling, sample control, references to analytical methods and analyte lists, laboratory Quality Control (QC) and procedures, required limits of detection, known matrix interference potential, field QC, health and safety, schedules and frequency of sampling, data review, data acceptability, and reporting.

#### ***Sample Management Office (SMO)***

Environmental samples are packaged, shipped, and tracked to off-site (contracted) laboratories by the SMO. The SMO is responsible for QA and QC once the samples are relinquished to the SMO by field team members.

Some samples are processed and analyzed for radiological constituents by the SNL/NM Radiation Protection Sample Diagnostics (RPSD) laboratory in accordance with RPSD procedures.

The SMO's roles and responsibilities include providing guidance and sample management support for field activities. However, each distinct program is responsible for its overall adherence and compliance regarding any sampling and analysis activity performed.

### ***Selection of a Contract Laboratory***

All off-site contract laboratories are selected based on performance objectives, licenses and accreditations, and appraisal (pre-award assessment) as described in the *Quality Assurance Project Plan (QAPP) for the SMO* (SNL 2010e). All laboratories must employ U.S. Environmental Protection Agency (EPA) test procedures wherever possible; when these are not available, other suitable and validated test procedures are applied. Laboratory instruments must be calibrated in accordance with established procedures, methods, and the SMO Statement of Work (SOW). All calibrations and detection limits must be verified before sample analysis and data reporting. Once a laboratory has passed initial appraisal and has been awarded a contract, the SMO is responsible for continuously monitoring laboratory performance to ensure that the laboratories are audited annually and meet their contractual requirements.

Contract laboratories are required to participate in applicable DOE and EPA programs for blind audit check sampling to monitor the overall accuracy of analyses routinely performed on SNL/NM samples.

### ***Project QC Samples***

Project-specified QC samples are submitted to contract laboratories in order to meet project Data Quality Objectives (DQO) and SAP requirements. Various field QC samples are collected to assess the quality and final usability of the data. Errors that can be introduced into the sampling process include potential sample contamination in the field or during the transportation of samples, some of which are unavoidable. Additionally, the variability present at each sample location can also affect sample results.

### ***Laboratory QC***

With each SNL/NM sample batch, laboratory QC samples are concurrently prepared at defined frequencies and analyzed in accordance with established methods. Analytical accuracy, precision, contamination, and matrix effects associated with each analytical measurement are determined.

QC sample results are compared either to statistically established control criteria or prescribed acceptance control limits. Analytical results generated concurrently with QC sample results within established limits are considered acceptable. If QC analytical results exceed control limits, the results are qualified, and corrective action is initiated if warranted. Reanalysis is then performed for samples in the analytical batch as specified in the SOW and laboratory procedures. QC sample summaries are included in analytical reports prepared by contract laboratories for SNL/NM.

## **8.3 2009 SMO Activities**

In 2009, the SMO processed a total of 3,358 samples in support of Sandia projects, including:

- Environmental Monitoring (air and water),
- Terrestrial Surveillance,
- Long-Term Stewardship (LTS),
- Waste characterization,
- Decontamination and Demolition (D&D), and
- Environmental Restoration (ER).

Of these, 3,068 were for environmental monitoring and surveillance projects. A total of 700 samples were submitted as field and analytical QC samples to assist with data validation and decision making. Approximately 610 of the 700 QC samples were taken for environmental monitoring and surveillance projects.

SMO contract laboratories perform work in compliance with the Sandia SOW for analytical laboratories (Puissant 2009).

### ***Inter-Laboratory Comparisons***

SMO contract laboratories are required to participate in the DOE Mixed Analyte Performance Evaluation Program (MAPEP). They also participate in commercial vendor programs designed to meet the requirements given in the proficiency testing section (Chapter II) of the National Environmental Laboratory Accreditation Conference (NELAC) Standard. SMO contract laboratories have a history of achieving a 90 percent or greater success rate during these comparisons. Acceptable results are based either on established control limits (as stated in the applicable methods) or statistically applied acceptance windows



### SMO Sample Processing

The SMO processed the following types of samples in 2009 in support of SNL/NM projects:

- Radioactive waste
- Mixed waste
- Hazardous waste
- D&D, D&D swipes and materials
- Sludges and liquids
- Soil
- Groundwater
- Decon water
- Solid waste
- Air
- Wastewater effluent
- Surface water
- Storm water
- Soil gas
- Air filters

as determined by the performance evaluation provider. Windows are typically two or three standard deviations around the true value.

### Laboratory QA

In 2009, the SMO continued on-site data package assessments and validation at the NELAC approved laboratories used by Sandia. Data packages (including a wide array of analysis methods) are requested at the time of the on-site visit. The laboratories are not notified in advance and do not know which data packages will be assessed. The handling history of the data package is carefully reviewed from sample receipt to data completion by retracing each step through documentation files. Specific checks for documentation completeness, proper equipment calibration, and batch QC data are made. These assessments focus on data defensibility and regulatory compliance.

During 2009, Sandia employed the following contract laboratories to perform analysis of SNL/NM samples:

- *General Engineering Laboratories (GEL)* in Charleston, South Carolina.
- *Test America Inc.* (formerly Severn Trent) in St. Louis, Missouri; Costa Mesa, California; Austin, Texas; and Arvada, Colorado.
- *ARS Analytical* (formerly Assaigai Laboratory) in Albuquerque, New Mexico.
- *BWXT Services* in Lynchburg, Virginia

### QA Audits

The DOE Consolidated Audit Program (DOECAP) conducted audits in 2009 at the primary SMO contract laboratories using DOECAP Quality Systems Analytical Services (QSAS) requirements. The audit reports, responses from the labs, and closure letters are all posted and tracked through the DOECAP website. The SMO works closely with the contract laboratories to expeditiously resolve audit findings. Decisions regarding sample distribution to contract laboratories are based on audit information, including outstanding corrective actions. In 2009, no Priority-1 findings that impacted SMO work were documented during laboratory audits. All corrective actions were expeditiously resolved.

### Data Validation and Records Management

Sample collection, Analysis Request and Chain of Custody (ARCOC) documentation and measurement data were reviewed and validated for each sample collected. Analytical data reported by the laboratories were reviewed to assess laboratory and field precision, accuracy, completeness, representativeness, and comparability with respect to method compliance and the DQOs of the particular program.

The following sources reviewed and validated data at a minimum of three levels:

1. The analytical laboratory, where data was validated according to the laboratory's QA plan, Standard Operating Procedures (SOP), and client-specific requirements,
2. A qualified member of Sandia's SMO staff, who reviews the analytical reports and corresponding sample collection and ARCOG documentation for completeness and laboratory contract compliance, and
3. A Sandia project leader, who is responsible for program objectives, regulatory compliance, and project-specific data quality requirements. The project leader makes the final decision regarding the usability and reporting of the data.

Additionally, all groundwater monitoring data, site wide confirmatory data, and a specified percentage of other program data are validated to detailed method-specified requirements and qualified in accordance with the *Data Validation Procedure for Chemical and Radiochemical Data* (SNL 2007).

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- 40 CFR 50      *National Primary and Secondary Ambient Air Quality Standards*
- 40 CFR 60      *Standards of Performance for New Stationary Sources*
- 40 CFR 61      *National Emission Standards for Hazardous Air Pollutants* (NESHAP) Subpart H, "National Emission Standards for Emissions of Radionuclides Other Than Radon from Department of Energy Facilities"
- 40 CFR 82      *Protection of Stratospheric Ozone*



40 CFR 112	<i>Oil Pollution Prevention</i>
40 CFR 122	<i>EPA Administered Permit Programs: The National Pollutant Discharge Elimination System (NPDES)</i>
40 CFR 141	<i>National Primary Drinking Water Regulations</i>
40 CFR 265	<i>Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities</i>
40 CFR 268	<i>Land Disposal Restrictions</i>
40 CFR 280	<i>Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks</i>
40 CFR 302	<i>Designation, Reportable Quantities, and Notification (CERCLA Implementing Regulation)</i>
40 CFR 355	<i>Emergency Planning and Notification</i>
40 CFR 370	<i>Hazardous Chemical Reporting: Community Right-To-Know</i>
40 CFR 372	<i>Toxic Chemical Release Reporting: Community Right-to-Know (EPCRA Implementing Regulation)</i>

## ***ACTS AND STATUTES***

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- Archaeological Resources Protection Act (ARPA) of 1979 (16 U.S.C. §470aa )
- Atomic Energy Act (AEA) of 1954 (42 U.S.C. §2011 et seq.)
- Clean Air Act (CAA) and CAA Amendments (CAAA) of 1990 (42 U.S.C. §7401)
- Clean Water Act (CWA) of 1977 (the Federal Water Pollution Control Act) (33 U.S.C. §1251)
- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (42 U.S.C. §9601) Amended by the Superfund Amendments and Reauthorization Act (SARA)
- Emergency Planning and Community Right to Know Act (EPCRA) of 1986 (42 U.S.C. §11001 et seq.) (Also known as SARA Title III.)
- Endangered Species Act (ESA) (16 U.S.C. §1531 et seq.)
- Federal Facility Compliance Act (FFCA) of 1992 (42 U.S.C. §6961)
- Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) (7 U.S.C. §136)
- Migratory Bird Treaty Act (MBTA) of 1918, as amended (16 U.S.C. §703 et seq.)
- National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. §4321)
- National Historic Preservation Act of 1966, as amended (16 U.S.C. §470 et seq.)
- Pollution Prevention Act of 1990 (42 U.S.C. §13101 et seq.)
- Quiet Communities Act of 1978 (42 U.S.C. §4901 et seq.)
- Resource Conservation and Recovery Act (RCRA) of 1976 (42 U.S.C. §6901 et seq.)
- Safe Drinking Water Act (SDWA) (42 U.S.C §300f)
- Superfund Amendments and Reauthorization Act (SARA) of 1986 (see CERCLA)
- Toxic Substances Control Act (TSCA) of 1976 (15 U.S.C. §2601 et seq.)

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**Note:** U.S.C. = United States Code

## ***APPLICABLE LOCAL AND STATE LAWS AND REGULATIONS FOR ENVIRONMENTAL PROGRAMS***

### ***Water Quality***

20.6.2 NMAC, *Ground and Surface Water Protection*  
20.6.4 NMAC, *Standards for Interstate and Intrastate Surface Waters*  
20.7.10 NMAC, *Drinking Water*  
Albuquerque/Bernalillo County Water Utility Authority, *Sewer Use and Wastewater Control Ordinance*

### ***Air Quality***

20.2.3 NMAC, *New Mexico Ambient Air Quality Standards*  
20.11.2 NMAC, *Fees*  
20.11.8 NMAC, *New Mexico Ambient Air Quality Standards*  
20.11.20 NMAC, *Fugitive Dust Control*  
20.11.21 NMAC, *Open Burning*  
20.11.100 NMAC, *Motor Vehicle Inspection*

### ***Miscellaneous***

NMSA 76-4-1 et seq. *New Mexico Pesticide Control Act*  
21.17.50 NMAC, *Pesticides*

### ***Oil Storage and Spill Containment***

#### ***Oil Storage Programs***

20.5 NMAC, *Petroleum Storage Tanks*

### ***Waste Management***

#### ***Hazardous Waste Management Program***

20.4.1 NMAC, *Hazardous Waste Management*

#### ***Solid Waste Program***

20.9 NMAC, *Solid Waste Management*

**TABLE 9-1. Summary of Environmental Permits and Registrations in Effect During 2009**

Permit Type and/or Facility Name	Location	Permit Number	Issue Date	Expiration Date	Regulatory Agency
<b>SEWER WASTEWATER</b>					
General	WW001 Station Manhole, south of TA-IV at Tijeras Arroyo	2069 A	7/17/08	2/28/13	ABCWUA
General	WW006 Station Manhole, at Pennsylvania Ave.	2069 F	Submitted to ABCWUA	Pending	ABCWUA
Microelectronics Development Laboratory (MDL)	WW007 Station Manhole, TA-I	2069 G	Submitted to ABCWUA	Pending	ABCWUA
General	WW008 Station Manhole, south of TA-II at Tijeras Arroyo	2069 I	Submitted to ABCWUA	Pending	ABCWUA
General	WW011 Station Manhole, north of TA-III (includes TAs-III and V, and Coyote Test Field sewer lines)	2069 K-5	Submitted to ABCWUA	Pending	ABCWUA
Center for Integrated Nano-Technologies (CINT)	CINT	2238A	1/5/07	4/30/11	ABCWUA
<b>SURFACE DISCHARGE</b>					
Pulsed Power Development Facilities (Discharge Plan)	TA-IV, Lagoons I and II	DP-530	9/21/07	9/21/12	NMED
<b>UNDERGROUND STORAGE TANKS (UST)</b>					
UST (20,000 gallons)	TA-I	1368	6/1/08	6/01/09	NMED
UST (20,000 gallons)	TA-I	1369	6/1/08	6/01/09	NMED
<b>ABOVE GROUND STORAGE TANKS (AST)</b>					
AST / 2,000	TA-I	1370	6/1/08	6/01/09	NMED
AST / 5,000	TA-III	1370	6/1/08	6/01/09	NMED
AST / 25,000	CTF	1370	6/1/08	6/01/09	NMED
<b>STORM WATER</b>					
<b>NPDES INDUSTRIAL PERMITS</b>					
National Pollution Discharge Elimination System (NPDES) "Multi-sector General" Permit	Storm water discharges from Industrial Activities at SNL/NM on KAFB	SNL/NM – NMR05GQ63 DOE/SSO – NMR05GP29	10/09 11/09	9/13 9/13	EPA
National Pollution Discharge Elimination System (NPDES) "Multi-sector General" Permit	Storm water discharges from Industrial Activities at the FAA/AANC/NDI Validation Center	SNL/NM – NMR05GL17 DOE/SSO – NMR05GH54	6/09 6/09	6/14 6/14	EPA EPA

**TABLE 9-1. Summary of Environmental Permits and Registrations in Effect During 2009 (Continued)**

Permit Type and/or Facility Name	Location	Permit Number	Issue Date	Expiration Date	Regulatory Agency
<b>NPDES CONSTRUCTION PERMITS</b>					
Microsystems and Engineering Science Applications (MESA) Facility	TA-I	SNL/NM - NMR15DQ19 DOE/SSO - NMR15EZ62	03/19/02	7/31/09	EPA
20 <sup>th</sup> Street Stockpile Area	TA-I	SNL/NM - NMR15E764 DOE/SSO - NMR15EB81	04/29/05	Active until terminated	EPA
Mixed Waste Landfill Cover	TA-III	SNL/NM -NMR15EZ15 DOE/SSO - NMR15EZ62	05/18/06	Active until terminated	EPA
Technical Area III Concrete Recycle/Borrow	TA-III	SNL/NM -NMR15F015 DOE/SSO -NMR15F012	5/31/06	Active until terminated	EPA
Technical Area III Cable Debris	TA-III	SNL/NM -NMR15G396	8/7/08	Active until terminated	EPA
I Ave, 7th and 8th Street Infrastructure and Utility Improvements	TA-I	SNL/NM -NMR10GN27 DOE/SSO -NMR10GJ52	07/29/09	Active until terminated	EPA
Technical Area II Fence Removal	TA-II	SNL/NM -NMR15F099	8/17/07	Active until terminated	EPA
I Ave and 11th Street Mall Waterline Project	TA-I	SNL/NM -NMR10GE04 DOE/SSO -NMR10GJ52	2/9/09	Active until terminated	EPA
Heating Systems Modernization (HSM)	TA-I	SNL/NM -NMR15FK02	5/11/07	Active until terminated	EPA
G, H, 11th Street	TA-I	SNL/NM -NMR15FV53 DOE/SSO -NMR15FV52	1/31/08	12/31/08	EPA
Liquid Natural Gas	TA-III	SNL/NM -NMR10G703	10/31/08	Active until terminated	EPA
Thunder Range	Range 6 Site 91 Breaching Site Site 9965	SNL/NM -NMR15G365 DOE/SSO -NMR15G366	6/03/08	Active until terminated	EPA
TA II Escarpment	TA-II	SNL/NM -NMR10G475	08/12/08	Active until terminated	EPA
18 <sup>th</sup> Street and K Ave Detention Facility	TA-I	SNL/NM -NMR10G684	10/31/08	Active until terminated	EPA
Ion Beam Laboratory	TA-I	SNL/NM -NMR10G588	10/01/08	Active until terminated	EPA
T-Bldg and MO Removals	TA-I	SNL/NM -NMR10GM41	7/23/09	Active until terminated	EPA
9940 Complex	Coyote	SNL/NM -NMR10GO81 DOE/SSO -NMR15G366	9/1/09	Active until terminated	EPA
Building 957 Parking Lot	TA-I	SNL/NM -NMR10GS55	12/14/09	Active until terminated	EPA

**TABLE 9-1. Summary of Environmental Permits and Registrations in Effect During 2009 (Continued)**

Permit Type and/or Facility Name	Location	Permit Number	Issue Date	Expiration Date	Regulatory Agency
<b>ECOLOGICAL</b>					
New Mexico Department of Game and Fish Authorization for Taking Protected Wildlife for Scientific/Educational Purposes	Site-Wide Ecological Monitoring	2931	3/18/09	12/31/09	NM Department of Game and Fish
NM Department of Game and Fish Nuisance Permit	Site-Wide Ecological Monitoring Activity	NA	3/3/09	3/3/10	NM Department of Game and Fish
<b>RCRA</b>					
Hazardous Waste Facility Permit Modules I - III	Hazardous Waste Management Facility (HWMF), TA-II	NM5890110518-1	8/6/92	08/06/02, remains in effect until permit is renewed	NMED
Hazardous Waste Facility Permit Module IV	Environmental Restoration (ER) Sites	NM5890110518-1	8/26/93	9/20/02, remains in effect until permit is renewed	NMED
Hazardous Waste Treatment Facility Permit Modules I - III	Thermal Treatment Facility (TTF), TA-III	NM5890110518-2	12/4/94	12/4/04, remains in effect until permit is renewed	NMED
Class III Permit Modification for the Management of Hazardous Remediation Waste in the Corrective Action Management Unit (CAMU), Tech Area III	CAMU, TA-III	NM5890110518	9/25/97	9/20/02, remains in effect until permit is renewed	NMED
RCRA Part A Permit Application for Hazardous Waste Management Units	RMWMF; 5 Manzano Bunkers; Auxiliary Hot Cell Facility	NM5890110518	Application for interim status first submitted 8/90; most recent revision 3/22/2007	No expiration date	NMED
RCRA Closure Plan Amendment for the Chemical Waste Landfill	CWL, TA-III	N/A	10/15/09	N/A	NMED



**TABLE 9-1. Summary of Environmental Permits and Registrations in Effect During 2009 (Continued)**

Permit Type and/or Facility Name	Location	Permit Number	Issue Date	Expiration Date	Regulatory Agency
<b>OPEN BURN PERMITS*</b>					
10,000-gallon Large Scale LNG Open Pool Burn	TA-III	07-0064	2/1/2009	2/28/2009	COA
310,000-gallon Large Scale LNG Open Pool Burn	TA-III	07-0066	12/1/2009	12/31/2009	COA
Blast-Induced Fragment Characterization – Test 1	TA-III	08-0049	2/1/2010	2/28/2010	COA
Blast-Induced Fragment Characterization – Test 2	TA-III	08-0050	2/1/2010	2/28/2010	COA
Blast-Induced Fragment Characterization – Test 3	TA-III	08-0051	2/1/2010	2/28/2010	COA
Explosives Testing	Remote	08-0074	1/1/2009	12/31/2009	COA
Explosive Improvised Device Tests	Remote	08-0075	1/1/2009	12/31/2009	COA
Terminal Ballistics Facility – Explosives Applications	TA-III	08-0076	1/1/2009	12/31/2009	COA
Terminal Ballistics Facility –Thermite Applications	TA-III	08-0077	1/1/2009	12/31/2009	COA
Terminal Ballistics Facility – Propellant Applications	TA-III	08-0083	1/1/2009	12/31/2009	COA
Thermal Treatment Facility	TA-III	08-0084	1/1/2009	12/31/2009	COA
Lurance Burn Site - Igloo Building	Remote	08-0085	1/1/2009	12/31/2009	COA
Lurance Burn Site – Large Burn Pool	Remote	08-0086	1/1/2009	12/31/2009	COA
Lurance Burn Site – Wood Crib Fire Tests	Remote	08-0087	1/1/2009	12/31/2009	COA
Thunder Range – Explosives Testing	Remote	08-0088	1/1/2009	12/31/2009	COA
Dynamic Explosive Testing System – Explosives Testing	Remote	08-0089	1/1/2009	12/31/2009	COA
Nuclear and Energy Work Complex – Sodium Metal Tests	TA-III	08-0090	1/1/2009	12/31/2009	COA
Explosive Improvised Device Tests	Remote	08-0091	1/1/2009	12/31/2009	COA
Mandall Explosive Testing Program	TA-III	09-0020	5/1/2009	12/31/2009	COA
DESIREE – Igloo Building	Remote	09-0052	9/14/2009	12/31/2009	COA
<b>AIR (Permits &amp; Registrations)</b>					
Document Disintegrator	TA-III	Permit #144-M1	9/28/2006	N/A	COA
Fire Laboratory used for the Authentication of Modeling and Experiments (FLAME)	Burn Site	Registration #196	5/19/1988	N/A	COA
Neutron Generator Facility (NGF)	TA-I	Permit #374-M1	7/17/1998	N/A	COA
Standby diesel generators at Bldg 862	TA-I	Permit #402	5/07/1996	N/A	COA
Radioactive and Mixed Waste Management Facility (RMWMF)	TA-III	Permit #415-M1	5/10/1997	N/A	COA

**TABLE 9-1. Summary of Environmental Permits and Registrations in Effect During 2009 Continued)**

Permit Type and/or Facility Name	Location	Permit Number	Issue Date	Expiration Date	Regulatory Agency
<b>AIR (Permits &amp; Registrations) (concluded)</b>					
Title V Operating Permit	Site-Wide	515 (pending)	Submitted 3/1/1996	N/A	COA
Emergency Generator at Building 702	TA-I	Permit #924	5/5/1998	N/A	COA
Processing and Environmental Technology Laboratory (PETL) Emergency Generator	TA-I	Permit #925-M1	3/5/2001	N/A	COA
PETL Boilers and HAP Chemicals	TA-I	Registration #936	5/5/2004	N/A	COA
Advanced Manufacturing Prototype Facility (AMPF)	TA-I	Registration #1406	11/6/2000	N/A	COA
Microelectronics Development Laboratory (MDL)	TA-I	Permit #1678-M1	12/14/2004	N/A	COA
Steam Plant	TA-I	Permit #1705-M1	11/10/2004	N/A	COA
Thermal Test Complex	TA-III	Permit #1712	4/9/2004	N/A	COA
Center for Integrated Nanotechnology (CINT)	Sandia Science & Technology Park	Permit #1725	10/11/2004	N/A	COA
MESA Facility Central Utility Building 858J	TA-I	Permit #1820	9/28/2006	N/A	COA
Building 899A Boilers	TA-I	Registration #1823	4/1/2008	N/A	COA
South East Tech Area I	TA-I	Permit #1828	9/28/2006	N/A	COA
Heating System Modernization Boilers	TA-I	Permit #1830	3/23/2007	N/A	COA
Building 878 HAP Chemical Registration	TA-I	Registration #1888	5/28/2008	N/A	COA
Strategic Defense Facility, Building 963	TA-IV	Permit#1900	1/11/2008	N/A	COA
Miscellaneous HAP Registration	Sitewide Permit	Registration #1901	5/28/2008	N/A	COA
Building 865 HAP Registration	TA-I	Registration #1902	5/28/2008	N/A	COA
Solar Tower HAP Registration	Remote	Registration #1903	5/28/2008	N/A	COA
Building 869 HAP Registration	TA-I	Registration #1905	5/28/2008	N/A	COA
Advanced Materials Laboratory (AML) HAP Registration	Offsite	Registration #1906	5/28/2008	N/A	COA

**TABLE 9-1. Summary of Environmental Permits and Registrations in Effect During 2009 (Concluded)**

Permit Type and/or Facility Name	Location	Permit Number	Issue Date	Expiration Date	Regulatory Agency
<b>FUGITIVE DUST CONTROL AND DEMOLITION PERMIT FILE*** (Permits &amp; Registrations)</b>					
Borrow Site – Cell 1 Programmatic	TA-III	P08-0005	12/10/2007	12/10/2012	COA
Moving Vehicle Test Track Programmatic	TA-III	P08-0004	12/11/2007	12/11/2012	COA
Building 9940 Programmatic	Remote	P08-0006	12/10/2007	12/10/2012	COA
Thunder Range – Range 6 programmatic	Remote	P08-0061	7/18/2008	7/18/2013	COA
Thunder Range – Range 1 Programmatic	Remote	P08-0062	8/7/2008	8/7/2013	COA
Thunder Range – Range 2 Programmatic	Remote	P08-0064	8/7/2008	8/7/2013	COA
Thunder Range – Range 5 Programmatic	Remote	P08-0063	7/2/2008	7/2/2013	COA
Thunder Range – Range 7 Programmatic	Remote	P09-0021	12/22/2009	12/22/2014	COA
Thunder Range – Range 4 Programmatic	Remote	P09-0022	12/22/2009	12/22/2014	COA
Thunder Range – Range 8 Programmatic	Remote	P09-0018	8/14/2009	8/14/2014	COA
TA-I Infrastructure	TA-I	10-344-3663	2/6/2007	12/31/2009	COA
Large Scale LNG Test Site	TA-III	1009-626-3732	5/5/2007	12/31/2009	COA
HSM Project	TA-I	10-10-3726	5/14/2007	12/31/2010	COA
Ion Beam Lab Construction	TA-I	10-204-4014	6/30/2008	6/30/2013	COA
Cable Debris Removal	TA-III	10-683-3968	4/30/2008	4/30/2009	COA
Building 857 Renovations	TA-I	1009-264-3978	5/12/2008	5/12/2009	COA
Building 807 Demolition	TA-I	10-204-4013	6/30/2008	6/30/2009	COA
Detention Basin Facility	TA-I	10-204-4088	11/19/2008	11/19/2009	COA
TA-I Water Main Replacement	TA-I	10-344-4141	3/23/2009	3/23/2010	COA
Building 919 Demolition	TA-II	10-210-4142	3/23/2009	3/23/2010	COA
Steam Plant Tank Farm Removal	TA-I	10-210-4147	4/3/2009	4/3/2010	COA
Tank Farm Fuel Line Removal	TA-I	10-354-4148	4/3/2009	4/3/2010	COA
Mixed Waste Landfill Cover	TA-III	10-683-4161	4/28/2009	4/28/2010	COA
Borrow Pit Cell 2	TA-III	10-683-4162	4/28/2009	4/28/2010	COA
Borrow Pit Cell 3	TA-III	10-683-4160	4/28/2009	4/28/2010	COA
9920 Berm Construction	TA-III	10-62-4169	5/6/2009	5/6/2010	COA
Substation 16 Replacement	Remote	10-469-4170	5/15/2009	5/15/2010	COA
Mobile Office and T-Building Demolition and Removal	TA-I	10-210-4195	7/6/2009	7/6/2010	COA
14 <sup>th</sup> Street Channel Repairs	TA-II	10-564-4208	7/27/2009	7/27/2010	COA
Building 957 Parking Lot Repairs	TA-II	1009-720-4284	12/11/2009	12/11/2010	COA

**NOTES:** † Registration = Certificate - no permit required

PCB = polychlorinated biphenyl

\*Open Burn Permits are issued by the City of Albuquerque for no more than a year at any one time.

\*\*Sandia submitted a timely application for permit renewal. The expired permit remains in force until the new one is issued.

\*\*\*Permits are obtained by general contractors directly from City of Albuquerque

COA = City of Albuquerque

TA= technical area

EPA = U.S. Environmental Protection Agency

N/A = not applicable

NMED = New Mexico Environment Department

RCRA = Resource Conservation and Recovery Act

N/A = not applicable

@ =DOE/SSO Permits

\*\*\*\*No tests were conducted in association with this Permit in CY2008.

**TABLE 9-2. Federal and State Air Regulations Applicable to SNL/NM**

CAA Title	CAA Section	Federal Regulation	Local Regulation	Subject
<b>I</b>	176(c)	40 CFR 51 40 CFR 93	20 NMAC 11.04 20 NMAC 11.03	Conformity of Federal Actions (State and Federal Plans) General and Transportation
	110	40 CFR 53 40 CFR 58	N/A	Ambient Air Quality Surveillance
	109	40 CFR 50	20 NMAC 11.08	National Primary and Secondary Ambient Air Quality Standards (NAAQS)
	165-166	40 CFR 52	20 NMAC 11.02	Permit Fees
		40 CFR 52	20 NMAC 11.05	Visible Air Contaminants
		40 CFR 52	20 NMAC 11.06	Emergency Action Plan
		40 CFR 52	20 NMAC 11.07	Variance Procedure
		40 CFR 52	20 NMAC 11.20	Fugitive Dust Control
		40 CFR 52	20 NMAC 11.21	Open Burning
		40 CFR 51-52	20 NMAC 11.40	Source Registration
		40 CFR 51-52	20 NMAC 11.41	Authority-to-Construct
		40 CFR 51.100	20 NMAC 11.43	Stack Height Requirements
		40 CFR 51	20 NMAC 11.44	Emissions Trading
	171-193	40 CFR 51-52	20 NMAC 11.60	Permitting in Nonattainment Areas
	160-169	40 CFR 52	20 NMAC 11.61	Prevention of Significant Deterioration
	165-166	40 CFR 60 40 CFR 63	20 NMAC 11.65	Volatile Organic Compounds (VOC)
		40 CFR 60	20 NMAC 11.66	Process Equipment
		40 CFR 60	20 NMAC 11.22	Wood Burning
		40 CFR 60	20 NMAC 11.63	New Source Performance Standards (NSPS)
		40 CFR 60	20 NMAC 11.67	Equipment, Emissions and Limitations(stationary combustion sources)
		40 CFR 60	20 NMAC 11.68	Incinerators
		40 CFR 60	20 NMAC 11.69	Pathological Waste Destructors
		40 CFR 61 40 CFR 63	20 NMAC 11.64	National Emission Standards for Hazardous Air Pollutants (NESHAP)Subpart H – Radionuclides Subpart M – Asbestos
<b>II</b>	202-211	40 CFR 80	20 NMAC 11.101	Motor Vehicle Inspection: Centralized
			20 NMAC 11.102	Oxygenated Fuels
			20 NMAC 11.103	Motor Vehicle Visible Emissions
	213-219	40 CFR 85-86	20 NMAC 11.100	Motor Vehicle Inspection: Decentralized
<b>III</b>	319	40 CFR 53	20 NMAC 2.3 20 NMAC 2.5	Air Quality Monitoring
<b>IV</b>	401-416	40 CFR 72-78	20 NMAC 11.62	Acid Rain
<b>V</b>	501-507	40 CFR 70-71	20 NMAC 11.42	Operating Permits
<b>VI</b>	601-618	40 CFR 82	20 NMAC 11.23	Stratospheric Ozone Protection
<b>VII</b>	113-114	40 CFR 64	20 NMAC 11.90	Administration, Enforcement, Inspection

**NOTES:** CAA = Clean Air Act  
 NMAC = New Mexico Administrative Code  
 CFR = Code of Federal Regulations

**TABLE 9-3. Summary of Compliance History with Regard to Mixed Waste (MW) at SNL/NM**

Date	Milestone	Comment
1984	Amendments to Resource Conservation and Recovery Act (RCRA) and Hazardous and Solid Waste Amendments (HSWA) in 1984	MW became an issue after amendments to RCRA and HSWA enforced Land Disposal Restrictions (LDRs), including prohibition on storage of wastes for more than one year.
Aug 1990	RCRA Part A Interim Status Permit Application	Submitted RCRA Part A Interim Status Permit application for MW storage. Later revisions to the interim status permit added proposed MW treatment processes.
Oct 1992	Federal Facilities Compliance Act (FFCA) Passed	The FFCA allows storage of MW over one-year RCRA time limit. Requires U.S. Department of Energy (DOE) to submit a site treatment plan for MW.
Dec 1992	Notice of Noncompliance (NON) Issued	U.S. Environmental Protection Agency (EPA) issued a NON for storage of RCRA-regulated MW over the one-year maximum period.
Oct 1993	Conceptual Site Treatment Plan Submitted	DOE submitted <i>Conceptual Site Treatment Plan for Mixed Waste</i> to NMED; other drafts followed.
Mar 1995	Final Site Treatment Plan Submitted	DOE submitted final <i>Site Treatment Plan for Mixed Waste</i> to NMED.
Jun 1995	Historical Disposal Requests Validation (HDRV) Project Initiated	The HDRV Project was initiated to characterize and sort legacy MW. Project continued into 1997, when it was replaced with new sorting procedures.
Oct 1995	Federal Facility Compliance Order (FFCO) Signed	The FFCO, an agreement between State, DOE, and Sandia Corporation, details specific actions required with regard to MW management, including the requirement to develop of a Site Treatment Plan (STP), to be updated annually.
Mar 1996	STP Milestones Met	Updated STP to reflect FY 1995 activities.
Sep 1996	First MW Shipment  FFCO Amendment No. 1	First MW shipment made, MW sent to Perma-Fix/DSSI for treatment.  FFCO amended.
Dec 1996	Revisions to Proposed Treatment Methods	DOE and Sandia re-submitted Part A and B permit application, to reflect revisions to proposed on-site treatment methods.
May 1997	FFCO Amendment No. 2	FFCO amended.
Dec 1997	On-site MW Treatment	Onsite treatment of MW began at the RMWMF in Bldg. 6920. Additionally, Bldg. 6921 was converted to a laboratory for the treatment of certain types of MW.
1997	STP Milestones Met	Treated wastes on site and shipped mixed wastes to off-site treatment and disposal facilities, meeting all treatment and disposal milestones. Updated STP to reflect FY 1996 activities and changes to proposed treatment technologies. NMED approved Revision 1 to STP, revising waste volumes and treatment/disposal technologies, and establishing new deadlines.
1998	STP Milestones Met	Treated wastes on site and shipped mixed wastes to off-site treatment and disposal facilities, meeting all treatment and disposal milestones. Updated STP to reflect FY 1997 activities and changes to proposed treatment technologies. NMED approved Revision 2 to STP, revising waste volumes and treatment/disposal technologies, and establishing new deadlines.

**TABLE 9-3. Summary of Compliance History with Regard to Mixed Waste (MW) at SNL/NM**  
(Continued)

<b>Date</b>	<b>Milestone</b>	<b>Comment</b>
<b>1999</b>	STP Milestones Met	Treated wastes on site and shipped mixed wastes to off-site treatment and disposal facilities, meeting all treatment and disposal milestones. Updated STP to reflect FY 1998 activities and changes to proposed treatment technologies. NMED approved Revision 3 to STP, revising waste volumes and treatment/disposal technologies, and establishing new deadlines.
<b>2000</b>	STP Milestones Met	Treated wastes on site and shipped mixed wastes to off-site treatment and disposal facilities, meeting all treatment and disposal milestones. Updated STP to reflect FY 1999 activities and changes to proposed treatment technologies. NMED approved Revision 4 to STP, revising waste volumes and treatment/disposal technologies, and establishing new deadlines.
<b>2001</b>	STP Milestones Met	Treated wastes on site and shipped mixed wastes to off-site treatment and disposal facilities, meeting all treatment and disposal milestones. Updated STP to reflect FY 2000 activities and changes to proposed treatment technologies. NMED approved Revision 5 to STP, revising waste volumes and treatment/disposal technologies, and establishing new deadlines.
<b>May 2001</b>	FFCO Amendment No. 3	FFCO amended.
<b>2002</b>	STP Milestones Met	Treated wastes on site and shipped mixed wastes to off-site treatment and disposal facilities, meeting all treatment and disposal milestones. Updated STP to reflect FY 2001 activities and changes to proposed treatment technologies. NMED approved Revision 6 to STP, revising waste volumes and treatment/disposal technologies, and establishing new deadlines.
<b>Feb 2002</b>	Revisions to Permit Application	DOE and Sandia submitted updated Part A and B permit application to NMED to reflect revisions to on-site waste management operations. Permit application for mixed waste management units is combined with permit renewal request for hazardous waste management units at SNL/NM.
<b>2003</b>	STP Milestones Met	Treated wastes on site and shipped mixed wastes to off-site treatment and disposal facilities, meeting all treatment and disposal milestones. Updated STP to reflect FY 2002 activities and changes to proposed treatment technologies. NMED approved Revision 7 to STP, revising waste volumes and treatment/disposal technologies, and establishing new deadlines.
<b>Apr 2003; Nov 2003</b>	Revisions to Permit Application	DOE and Sandia revised Part A and Part B permit application in response to NMED comments.
<b>2004</b>	STP Milestones Met	Treated wastes on site and shipped mixed wastes to off-site treatment and disposal facilities, meeting all treatment and disposal milestones. Updated STP to reflect FY 2003 activities and changes to proposed treatment technologies. NMED approved Revision 8 to STP, revising waste volumes and treatment/disposal technologies, and establishing new deadlines.
<b>Apr 2004</b>	FFCO Amendment No. 4	FFCO amended



**TABLE 9-3. Summary of Compliance History with Regard to Mixed Waste (MW) at SNL/NM**  
(Concluded)

Date	Milestone	Comment
<b>Nov 2004</b>	Revisions to Permit Application	DOE and Sandia revised Part A and Part B permit application in response to NMED comments.
<b>2005</b>	STP Milestones Met	Treated wastes on site and shipped mixed wastes to off-site treatment and disposal facilities, meeting all treatment and disposal milestones. Updated STP to reflect FY 2004 activities and changes to proposed treatment technologies. NMED approved Revision 9 to STP, revising waste volumes and treatment/disposal technologies, and establishing new deadlines.
<b>Jun 2005; Oct 2005</b>	Revisions to Permit Application	DOE and Sandia revised Part A and Part B permit application to reflect changes in waste management operations.
<b>May 2006</b>	Revisions to Permit Application	DOE and Sandia revised Part B permit application to reflect changes in waste management operations.
<b>2006</b>	STP Milestones Met	Treated wastes on site and shipped mixed wastes to off-site treatment and disposal facilities, meeting all treatment and disposal milestones. Updated STP to reflect FY 2005 activities and changes to proposed treatment technologies. NMED approved Revision 10 to STP, revising waste volumes and treatment/disposal technologies, and establishing new deadlines.
<b>Mar 2007</b>	Revisions to Permit Application	DOE and Sandia revised Part A and Part B permit application to reflect changes in waste management operations.
<b>Aug 2007</b>	Draft Permit Issued	NMED issued draft permit to DOE and Sandia, and made it available for public comment.
<b>2007</b>	STP Milestones Met	Treated wastes on site and shipped mixed wastes to off-site treatment and disposal facilities, meeting all treatment and disposal milestones. Updated STP to reflect FY 2006 activities and changes to proposed treatment technologies. NMED approved Revision 11 to STP, revising waste volumes and treatment/disposal technologies, and establishing new deadlines.
<b>Jan 2008</b>	Comments on Draft Permit Submitted	DOE and Sandia submit extensive comments on draft permit to NMED and request resolution of comments.
<b>2008</b>	STP Milestones Met	Treated wastes on site and shipped mixed wastes to off-site treatment and disposal facilities, meeting all treatment and disposal milestones. Updated STP to reflect FY 2007 activities and changes to proposed treatment technologies. NMED approved Revision 12 to STP, revising waste volumes and treatment/disposal technologies, and establishing new deadlines.
<b>2009</b>	STP Milestones Met	Treated wastes on site and shipped mixed wastes to off-site treatment and disposal facilities, meeting all treatment and disposal milestones. Updated STP to reflect FY 2008 activities and changes to proposed treatment technologies.

**NOTES:** NON = Notification of Non-compliance  
RCRA = Resource Conservation and Recovery Act  
HSWA = Hazardous and Solid Waste Amendments  
FFCA = Federal Facility Compliance Act  
NMED = New Mexico Environment Department  
DSSI = Diversified Scientific Services, Inc.  
FY = fiscal year  
DOE = Department of Energy  
HDRV = Historical Disposal Requests Validation  
STP = Site Treatment Plan  
FFCO = Federal Facility Compliance Order  
MW = Mixed Waste

**TABLE 9-4. Mixed Waste Treatment and Disposal Status (End of FY 2009)**

Waste Category	Volume (m <sup>3</sup> )	Description	Status and Plans
TG 1	0	Inorganic Debris with Explosive Component	No waste currently in inventory
TG 2	0	Inorganic Debris with a Water Reactive Component	No waste currently in inventory
TG 3	0.03	Reactive Metals	Utilizing on-site treatment or shipping to off-site treatment and disposal facilities. <sup>a</sup>
TG 4	0	Elemental Lead	No waste currently in inventory.
TG 5	0	Aqueous Liquids (Corrosive)	No waste currently in inventory.
TG 6	0	Elemental Mercury	No waste currently in inventory.
TG 7	0	Organic Liquids I	No waste currently in inventory.
TG 8	0.08	Organic Debris with Organic Contaminants	
TG 9	0.01	Inorganic Debris with TCLP Metals	Utilizing on-site treatment or shipping to off-site treatment and disposal facilities. <sup>a</sup>
TG 10	0.2	Heterogeneous Debris	Sort waste as needed to determine more suitable treatability groups.
TG 11	0	Organic Liquids II	No waste currently in inventory.
TG 12	0	Organic Debris with TCLP Metals	No waste currently in inventory.
TG 13	0	Oxidizers	No waste currently in inventory.
TG 14	0	Aqueous Liquids with Organic Contaminants	No waste currently in inventory.
TG 15	0	Soils <50 percent Debris & Particulates with TCLP Metals	No waste currently in inventory.
TG 16	0	Cyanide Waste	No waste currently in inventory.
TG 17	0	Liquid/Solid with Organic and/or Metal Contaminants	No waste currently in inventory.
TG 18	0	Particulates with Organic Contaminants	No waste currently in inventory.
TG 19	0	Liquids with Metals	No waste currently in inventory.
TG 20	0	Propellant with TCLP Metals	No waste currently in inventory.
TG 21	0.02	Sealed Sources with TCLP Metals	Utilizing on-site treatment or shipping to off-site treatment and disposal facilities. <sup>a</sup>
TG 22	0	Reserved	Not Applicable
TG 23	0	Thermal Batteries	No waste currently in inventory.
TG 24	0	Spark Gap Tubes with TCLP Metals	No waste currently in inventory.
TG 25	0.003	Classified Items with TCLP Metals	Utilizing on-site treatment and off-site treatment options, and investigating off-site disposal options.
TG 26	0	Debris Items with Reactive Compounds & TCLP Metals	No waste currently in inventory.
TG 27	0	High Mercury Solids & Liquids	No waste currently in inventory
TRU/MW	0.94	TRU/MW	Investigating off-site treatment and disposal options.

**NOTES:** <sup>a</sup> Treatment and/or disposal at one or more permitted off-site mixed waste management facilities. Treatments are detailed in the *Site Treatment Plan for Mixed Waste, Sandia National Laboratories, New Mexico* (SNL 2007d) and the *Site Treatment Plan for MW, FY09 Update* (SNL 2007c).  
TCLP = toxicity characteristic leaching procedure m<sup>3</sup> = cubic meters  
TRU/MW = transuranic/mixed waste

## RADIOLOGICAL DOSE

### Radiation Protection

The U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA) has established radiation protection standards for the public to control and limit radiation doses resulting from activities at DOE facilities. Sandia National Laboratories, New Mexico (SNL/NM) is the DOE facility specific to this discussion. Public areas are defined as any location that is accessible to non-DOE facility employees (e.g., excluding Sandia Corporation employees and contractors), such as Kirtland Air Force Base (KAFB) personnel and the surrounding community. Radiation protection standards are provided in DOE Order 5400.5, *Radiation Protection of the Public and the Environment* (DOE 1993). Environmental monitoring requirements for DOE operations are given in DOE Order 450.1, *Environmental Protection Program* (DOE 2008a). In addition to these quantitative standards, the overriding DOE policy is that exposures to the public shall be maintained “as low as reasonably achievable” (ALARA).

DOE Order 5400.5 limits the total annual effective dose equivalent (EDE) of all potential exposure pathways to the public (including air, water, and the food chain) to 100 millirem per year (mrem/yr). The Order lists the Derived Concentration Guides (DCGs) for radionuclides in water and air that could be continuously consumed or inhaled (365 days/year). This is a conservative approach that assumes that a member of the public resides at the location continuously. Table 9-5 lists the DCGs pertinent to activities at SNL/NM and to this report.

**TABLE 9-5.** Derived Concentration Guides (DCGs) for Selected Radionuclides\*

Radionuclide	Ingested Water		Inhaled Air <sup>†</sup>	
	DCG (μCi/ml)	f <sub>1</sub> Value**	DCG (μCi/ml)	Solubility Class
Tritium (water)	2 x 10 <sup>-3</sup>	--	1 x 10 <sup>-7</sup>	W
Cesium-137	3 x 10 <sup>-6</sup>	1	4 x 10 <sup>-10</sup>	D
Uranium, total (U <sub>tot</sub> )	6 x 10 <sup>-6</sup>	--	1 x 10 <sup>-13</sup>	Y

**NOTES:** μCi/ml = microcuries per milliliter

\*From Figure III-1, DOE Order 5400.5, Change 2, January 7, 1993 (DOE 1993). DCG for tritium in air is adjusted for skin absorption.

\*\*F<sub>1</sub> value is the gastrointestinal absorption factor. Listed DCG's for U<sub>tot</sub> are based on U<sub>nat</sub> listing in 5400.5 (DOE 1993).

- *Water Pathways* - DOE drinking water guidelines are based on an annual EDE not to exceed 4 mrem/yr. Guideline values for drinking water are calculated at 4 percent of ingested water using DCG values for specific nuclides.
- *Air Pathways* - DOE facilities are required to comply with U.S. Environmental Protection Agency (EPA) standards for radiation protection as given in National Emission Standards for Hazardous Air Pollutants (NESHAP), Subpart H, specific to radionuclides emitted from DOE facilities (with the exception of radon). This rule mandates that air emissions from DOE facilities shall not cause any individual of the public to receive an EDE of greater than 10 mrem/yr from air pathways. Table 9-6 summarizes the public radiation protection standards that are applicable to DOE facilities.

## WATER QUALITY MONITORING PARAMETERS

### Resource Conservation and Recovery Act (RCRA)

Table 9-7 lists the 40 CFR 265, Subpart F, parameters required for groundwater monitoring analysis, implemented under RCRA. Table 9-8 gives the EPA interim primary drinking water standards (40 CFR 265, Appendix III) for the groundwater monitoring parameters. Table 9-9 gives EPA secondary drinking water standards. At SNL/NM, this regulation applies to Environmental Restoration (ER) sites. Table 9-10 gives New Mexico Water Quality Control Commission (NMWQCC) Standards for groundwater.

**TABLE 9-6. General Dose Limits to the Public from DOE Facilities**

Pathway	Equivalent (EDE) Limit	Comments
All Pathways*	100 mrem/yr 1 mSv/yr	The EDE for any member of the public from all routine DOE operations (normal planned activities including remedial actions). Radiation dose occurring from natural background and medical exposures are not included in the total allowed dose from all pathways.
Air Pathway**	10 mrem/yr 0.10 mSv/yr	Sandia calculates doses resulting from all potential air depositions and direct inhalation (e.g., emissions, ground shine, food crops).

**NOTES:** \*DOE Order 5400.5, Chapters I and II (DOE 1993)

\*\*40 CFR 61, Subpart H for radionuclides, National Emission Standards for Hazardous Air Pollutants (NESHAP).

mrem/yr = millirem per year

mSv/yr = millisievert per year

DOE = Department of Energy

**TABLE 9-7. Groundwater Monitoring Parameters Required by 40 CFR 265, Subpart F\***

Contamination Indicator	Groundwater Quality	Appendix III <sup>†</sup> Drinking Water Supply
pH	Chloride	Arsenic
Specific Conductivity	Iron	Barium
Total Organic Halogen (TOX)	Manganese	Cadmium
Total Organic Carbon (TOC)	Phenol	Chromium
	Sodium	Fluoride
	Sulfate	Lead
		Mercury
		Nitrate (as N)
		Selenium
		Silver
		Endrin
		Lindane
		Methoxychlor
		Toxaphene
		2,4-D
		2,4,5-TP Silvex
		Radium
		Gross Alpha
		Gross Beta
		Coliform Bacteria
		Turbidity

**NOTES:** \*Resource Conservation and Recovery Act (RCRA)

<sup>†</sup>40 CFR 265, Appendix III.

pH = potential of hydrogen (acidity)

**TABLE 9-8. EPA Primary Drinking Water Supply Standards/New Mexico Drinking Water Standards**

<b>Inorganic Chemicals</b>	<b>MCL</b>	<b>Units</b>
Antimony	0.006	mg/L
Arsenic	0.010	mg/L
Asbestos	7	MFL
Barium	2.0	mg/L
Beryllium	0.004	mg/L
Cadmium	0.005	mg/L
Chromium	0.1	mg/L
Copper	1.3*	mg/L
Cyanide (free cyanide)	0.2	mg/L
Fluoride	4.0	mg/L
Lead	0.015	mg/L
Mercury (inorganic)	0.002	mg/L
Nickel (New Mexico only)	0.2	mg/L
Nitrate (measured as N)	10	mg/L
Nitrite (measured as N)	1	mg/L
Selenium	0.05	mg/L
Thallium	0.002	mg/L
<b>Organic Chemicals</b>	<b>MCL</b>	<b>Units</b>
Alachlor	0.002	mg/L
Atrazine	0.003	mg/L
Benzene	0.005	mg/L
Benzo(a)pyrene	0.0002	mg/L
Carbofuran	0.04	mg/L
Carbon tetrachloride	0.005	mg/L
Chlordane	0.002	mg/L
Chlorobenzene	0.1	mg/L
2,4-D	0.07	mg/L
Dalapon	0.2	mg/L
1,2-Dibromo-3-chloropropane (DBCP)	0.0002	mg/L
o-Dichlorobenzene	0.6	mg/L
p-Dichlorobenzene	0.075	mg/L
1,2-Dichloroethane	0.005	mg/L
1,1-Dichloroethylene	0.007	mg/L
cis-1,2-Dichloroethylene	0.07	mg/L
trans-1,2-Dichloroethylene	0.1	mg/L
Dichloromethane	0.005	mg/L
1,2-Dichloropropane	0.005	mg/L
Di(2-ethylhexyl)adipate	0.4	mg/L
Di(2ethylhexyl)phthalate	0.006	mg/L
Dinoseb	0.007	mg/L
Dioxin (2,3,7,8-TCDD)	0.00000003	mg/L
Diquat	0.02	mg/L
Endothall	0.1	mg/L
Endrin	0.002	mg/L
Ethylbenzene	0.7	mg/L

**TABLE 9-8. EPA Primary Drinking Water Supply Standards/New Mexico Drinking Water Standards (concluded)**

<b>Organic Chemicals (continued)</b>	<b>MCL</b>	<b>Units</b>
Ethylene Dibromide	0.00005	mg/L
Glyphosate	0.7	mg/L
Heptachlor	0.0004	mg/L
Heptachlor epoxide	0.0002	mg/L
Hexachlorobenzene	0.001	mg/L
Hexachlorocyclopentadiene	0.05	mg/L
Lindane	0.0002	mg/L
Methoxychlor	0.04	mg/L
Oxamyl (Vydate)	0.2	mg/L
Polychlorinated biphenyls (PCBs)	0.0005	mg/L
Pentachlorophenol	0.001	mg/L
Picloram	0.5	mg/L
Simazine	0.004	mg/L
Styrene	0.1	mg/L
Tetrachloroethylene	0.005	mg/L
Toluene	1	mg/L
Total Trihalomethanes (TTHMs)	0.1	mg/L
Toxaphene	0.003	mg/L
2,4,5-TP (Silvex)	0.05	mg/L
1,2,4-Trichlorobenzene	0.07	mg/L
1,1,1-Trichloroethane	0.2	mg/L
1,1,2-Trichloroethane	0.005	mg/L
Trichloroethylene	0.005	mg/L
Vinyl chloride	0.002	mg/L
Xylenes (total)	10	mg/L
<b>Radionuclides</b>	<b>MCL</b>	<b>Units</b>
Beta particles and photon emitters	4	mrem/yr
Gross alpha particle activity	15	pCi/L
Radium 226 and Radium 228 (combined)	5	pCi/L
Uranium	0.030	mg/L

**NOTES:** EPA = Environmental Protection Agency

\*action level concentrations which trigger systems into taking treatment steps if 10 percent of tap water samples exceed the value

\*\*New Mexico Drinking Water Standard only, EPA removed nickel in 1995

MCL = Maximum Contaminant Level

mg/L = milligram per liter

ml = milliliter

MFL= Micro-fibers per liter

mrem/yr = millirem per year

pCi/L = picocurie per liter



**TABLE 9-9.** EPA Secondary Drinking Water Supply Standards

Contaminant	Level
Aluminum	0.05 to 0.2 mg/L
Chloride	250 mg/L
Color	15 color units
Copper	1.0 mg/L
Corrosivity	Non-corrosive
Fluoride	2.0 mg/L
Foaming agents	0.5 mg/L
Iron	0.3 mg/L
Manganese	0.05 mg/L
Odor	3 threshold odor number
pH	6.5-8.5
Silver	0.1 mg/L
Sulfate	250 mg/L
Total dissolved solids (TDS)	500 mg/L
Zinc	5 mg/L

**NOTES:** EPA = Environmental Protection Agency  
mg/L = milligram per liter  
pH = potential of hydrogen (acidity)

**TABLE 9-10.** New Mexico Water Quality Control Commission (NMWQCC) Standards for Groundwater of 10,000 mg/L total dissolved solid (TDS) Concentration or Less

Contaminant	NMWQCC Standard	Units
<b>A. Human Health Standards</b>		
Arsenic	0.1	mg/L
Barium	1.0	mg/L
Cadmium	0.01	mg/L
Chromium	0.05	mg/L
Cyanide	0.2	mg/L
Fluoride	1.6	mg/L
Lead	0.05	mg/L
Total Mercury	0.002	mg/L
Nitrate (as N)	10.0	mg/L
Selenium	0.05	mg/L
Silver	0.05	mg/L
Uranium	5.0	mg/L
Radioactivity: Radium-226 & Radium 228	30.0	pCi/L
Benzene	0.01	mg/L
Polychlorinated biphenyls (PCB's)	0.001	mg/L
Toluene	0.75	mg/L
Carbon Tetrachloride	0.01	mg/L
1,2-dichloroethane (EDC)	0.01	mg/L
1,1-dichloroethylene (1,1-DCE)	0.005	mg/L
1,1,2,2-tetrachloroethylene (PCE)	0.02	mg/L
1,1,2- trichloroethylene (TCE)	0.1	mg/L
Ethylbenzene	0.75	mg/L
Total Xylene	0.62	mg/L
Methylene Chloride	0.1	mg/L
Chloroform	0.1	mg/L
1,1 –dichloroethane	0.025	mg/L
Ethylene dibromide (EDB)	0.0001	mg/L
1,1,1 –trichloroethane	0.06	mg/L
1,1,2 –trichloroethane	0.01	mg/L
1,2,2,2 –tetrachloroethane	0.01	mg/L
Vinyl Chloride	0.001	mg/L
PAHs: total naphtalene + monomethylnapthalenes	0.03	mg/L
Benzo(a)pyrene	0.0007	mg/L

**TABLE 9-10.** New Mexico Water Quality Control Commission (NMWQCC) Standards for Groundwater of 10,000 mg/L total dissolved solid (TDS) Concentration or Less (Concluded)

Contaminant	NMWQCC Standard	Units
<b>B. Other Standards for Domestic Water Supply</b>		
Chloride	250.0	mg/L
Copper	1.0	mg/L
Iron	1.0	mg/L
Manganese	0.2	mg/L
Phenols	0.005	mg/L
Sulfate	600.0	mg/L
Total Dissolved Solids	1000.0	mg/L
Zinc	10.0	mg/L
pH	Between 6 and 9	
<b>C. Standards for Irrigation Use</b> – Groundwater shall meet the standards of Subsection A,B, and C unless other wise provided		
Aluminum	5.0	mg/L
Boron	0.75	mg/L
Cobalt	0.05	mg/L
Molybdenum	1.0	mg/L
Nickel	0.2	mg/L

**NOTES:** mg/L = milligram per liter  
MAC = maximum allowable concentration  
pCi/L = picocurie per liter  
pH = potential of hydrogen (acidity)

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# 10.0 Glossary

## A

**Abatement** – Reducing the degree or intensity of, or eliminating, pollution.

**Absorption** – The uptake of water, other fluids, or dissolved chemicals by a cell or an organism (as tree roots absorb dissolved nutrients in soil.)

**Alluvial** – Relating to and/or sand deposited by flowing water.

**Ambient air** – Any unconfined portion of the atmosphere: open air, surrounding air.

**Analyte** – A substance or chemical constituent that is undergoing analysis.

**Antimony** – A metallic element having four allotropic forms, the most common of which is a hard, extremely brittle, lustrous, silver-white, crystalline material. It is used in a wide variety of alloys, especially with lead in battery plates, and in the manufacture of flame-proofing compounds, paint, semiconductor devices, and ceramic products.

**Appraisal** – A documented activity performed according to written procedures and specified criteria to evaluate the compliance and conformance of an organization with programs, standards, and other requirements contained in orders, laws, and regulations, or other requirements invoked by SNL.

**Aquifer** – An underground geological formation, or group of formations, containing water. A source of groundwater for wells and springs.

**Arroyo** – A deep gully cut by an intermittent stream; a dry gulch.

**Asbestos** – A mineral fiber that can pollute air or water and cause cancer or asbestosis when inhaled. Uses for asbestos-containing material include, but are not limited to, electrical and heat insulation, paint filler, reinforcing agents in rubber and plastics (e.g., tile mastic), and cement reinforcement.

**Audit** – 1. An examination of records or financial accounts to check their accuracy. 2. An adjustment or correction of accounts. 3. An examined and verified account.

## B

**Background radiation** – Relatively constant low-level radiation from environmental sources such as building materials, cosmic rays, and ingested radionuclides in the body.

**Basin** – 1. A low-lying area, wholly or largely surrounded by higher land, that varies from a small, nearly enclosed valley to an extensive, mountain-rimmed depression. 2. An entire area drained by a given stream and its tributaries. 3. An area in which the rock strata are inclined downward from all sides toward the center. 4. An area in which sediments accumulate.

**Best Management Practice (BMP)** – The preferred methods and practices for managing operations.

**Biological niche** – A role played by a species in the environment.

**Biota** – The animal and plant life of a given region.

**Borehole** – A hole created or enlarged by a drill or auger. Also known as drill hole.

## C

**Catchment basin** – The geographical area draining into a river or reservoir.

**Cesium-137** – A radioactive isotope of cesium used in radiation therapy and found in atmospheric fallout.

**Coniferous forest** – A type of forest characterized by cone-bearing, needle-leaved trees.

**Containment** – An enclosed space or facility to contain and prevent the escape of hazardous material.

**Containment cell** – An engineered structure designed to contain and prevent the migration of hazardous waste.

Contamination – Introduction into water, air, and soil of microorganisms, chemicals, toxic substances, wastes, or wastewater in a concentration that makes the medium unfit for its next intended use. Also applies to surfaces of objects, buildings, and various household and agricultural use products.

Corporate Work Process (CWP) – A five-element process for managing and performing work that applies to all activities, facilities, organizations, and employees.

Corrective action – 1. EPA can require treatment, storage and disposal (TSDF) facilities handling hazardous waste to undertake corrective actions to clean up spills resulting from failure to follow hazardous waste management procedures or other mistakes. The process includes cleanup procedures designed to guide TSDFs toward in spills. 2. An action identified to correct a finding that, when completed, fixes the problem or prevents recurrence.

## D

Data Quality Objectives (DQO) – Following a strategic, systematic process for planning scientific data collection efforts.

Decontamination – Removal of harmful substances such as noxious chemicals, harmful bacteria or other organisms, or radioactive material from exposed individuals, rooms and furnishings in buildings, or the exterior environment.

Demolition – The act or process of wrecking or destroying, especially destruction by explosives.

Discharge – Any liquid or solid that flows or is placed on or onto any land or into any water. This includes precipitation discharges to the storm drains, accidental or intentional spilling, leaking, pumping, pouring, emitting, emptying, or dumping of any material or substance on or into any land or water.

Discharge limits – The maximum concentration of a specified pollutant allowed to be discharged in a volume of water or wastewater.

Discharge point – The site or location of a release, flow or runoff of any waste governed by regulation.

Diurnal – 1. Relating to or occurring in a 24-hour period; daily. 2. Occurring or active during the daytime rather than at night: diurnal animals.

Dosimeter – A device used to measure the dose of ionizing radiation received by an individual.

## E

Ecology – The relationship of living things to one another and their environment, or the study of such relationships.

Ecosystem – The interacting system of a biological community and its non-living environmental surroundings.

Effective Dose Equivalent (EDE) – The weighted average of dose equivalents in certain organs or tissues of the body; this can be used to estimate the health-effects risk of the exposed individual.

Effluent – Wastewater (treated or untreated) that flows out of a treatment plant, sewer, or industrial outfall. Generally refers to wastes discharged into surface waters.

Electronic Product Environmental Assessment Tool (EPEAT) - Is a set of criteria in eight different electronic to determine the environmental attributes of a particular electronic office product. At this point, EPEAT is only targeting computer desktops/towers, notebook computers (laptops) and monitors.

Electroplating – To coat or cover with a thin layer of metal by electrodeposition.

Energy Star Operations - means the equipment (monitors) go into “sleep” (low energy) mode when inactive for a set period of time. (CSU enabled)

Environment – The sum of all external conditions affecting the life, development and survival of an organism.

Environment, Safety and Health (ES&H) – A program designed to protect and preserve the environment and to ensure the safety and health of its employees, contractors, visitors, and the public.

Environmental Assessment (EA) – An environmental analysis prepared pursuant to the National Environmental Policy Act (NEPA) to determine whether a federal action would significantly affect the environment and thus require a more detailed environmental impact statement.

Environmental Impact Statement (EIS) – A document required of federal agencies by the National Environmental Policy Act for major projects or legislative proposals significantly affecting the environment. A tool for decision making, it describes the positive and negative effects of the undertaking and cites alternative actions.



Environmental Management – A program designed to maintain compliance with EPA, state, local and DOE requirements.

Environmental Management System (EMS) – A continuing cycle of planning, evaluating, implementing, and improving processes and actions undertaken to achieve environmental goals.

Environmental Monitoring – The collection and analysis of samples or direct measurements of environmental media such as air, water, and soil.

Environmental Restoration (ER) – A project chartered with the assessment and, if necessary, the remediation of inactive waste sites.

Environmental surveillance – A program including surveys of soil and vegetation, water sampling and analysis, in an attempt to identify and quantify long-term effects of pollutants resulting from SNL operations.

Ephemeral stream – A stream channel which carries water only during and immediately after periods of rainfall or snowmelt.

ER site – Any location listed on the environmental restoration ER site list that has been identified as an area that is (or may be) contaminated-either on or beneath the land surface-as a result of SNL operations. Contaminants may be chemicals, radioactive material, or both.

Exceedance – Violation of the pollutant levels permitted by environmental protection standards.

Explosive waste – Any explosive substance, article, or explosive-contaminated item that cannot be used for its intended purpose and does not have a legitimate investigative or research use.

## *F*

Fault – A fracture in the continuity of a rock formation caused by a shifting or dislodging of the earth's crust, in which adjacent surfaces are displaced relative to one another and parallel to the plane of fracture.

Fauna – 1. Animals, especially the animals of a particular region or period, considered as a group. 2. A catalog of the animals of a specific region or period.

Flora – 1. Plants. 2. The plant life characterizing a specific geographic region or environment.

## *G*

Gamma Radiation – very high-energy/high-frequency electromagnetic radiation that is emitted by the nuclei of radioactive substances during decay, or by the interactions of high-energy electrons with matter. They are similar to, but have a shorter wavelength, than X-rays.

Geology – The scientific study of the origin, history, and structure of the earth.

Groundwater – The supply of fresh water found beneath the Earth's surface, usually in aquifers, which supply wells and springs. Because ground water is a major source of drinking water, there is growing concern over contamination from leaching agricultural or industrial pollutants or leaking underground storage tanks.

## *H*

Hazardous substance – 1. Any material that poses a threat to human health and/or the environment. Typical hazardous substances are toxic, corrosive, ignitable, explosive, or chemically reactive. 2. Any substance designated by EPA to be reported if a designated quantity of the substance is spilled in the waters of the United States or is otherwise released into the environment.

Hazardous waste – Waste that meets any of the following conditions:

Hazardous waste landfill – An excavated or engineered site where hazardous waste is deposited and covered.

Hazardous waste site – Any facility or location at which hazardous waste operations take place.

Herbicides – A chemical pesticide designed to control or destroy plants, weeds, or grasses.

High-Level Radioactive Waste (HLW) – Waste generated in core fuel of a nuclear reactor, found at nuclear reactors or by nuclear fuel reprocessing; is a serious threat to anyone who comes near the waste without shielding.

Hydrology – The science dealing with the properties, distribution, and circulation of water.

## I

**Illicit discharges** – The absolute prohibitions against the release of certain substances.

**Implementation Plan (IP)** – The plan developed by the Operational Readiness Review (ORR) or Readiness Assessment (RA) team that describes the specifics of approach, schedule, methodology, team members and their qualifications, and reporting requirements of the ORR or RA. The Implementation Plan (IP) is used by the team leader to execute the ORR or RA.

**Industrial discharges** – The absolute prohibitions against the release of certain substances.

**Inertial-confinement fusion** – A method of controlled fusion in which the rapid implosion of a fuel pellet, produced by laser, electron, or ion beams, raises the temperature and density of the pellet core to levels at which nuclear fusion can take place before the pellet flies apart.

**Inhalation hazard** – Risk from materials or chemicals that present a hazard if respired (inhaled) into the lungs.

**Insecticides** – A pesticide compound specifically used to kill or prevent the growth of insects.

**Integrated Laboratories Management System (ILMS)** – Framework for all management requirements for Sandia. It represents the complete set of policy, business rules, practices, and information that establishes Sandia's business expectations and intent.

**Integrated Safety Management System (ISMS)** Systematically integrates safety into management and work practices at all levels so that missions are accomplished while protecting the worker, the public, and the environment.

## L

**Lagoons** – 1. A shallow pond where sunlight, bacterial action, and oxygen work to purify wastewater; also used for storage of wastewater. 2. Shallow body of water, often separated from the sea by coral reefs or sandbars.

**Landfill** – 1. Sanitary landfills are disposal sites for non-hazardous solid wastes spread in layers, compacted to the smallest practical volume, and covered by material applied at the end of each operating day. 2. Secure chemical landfills are disposal sites for hazardous waste, selected and designed to minimize the chance of release of hazardous substances into the environment.

**Leachate** – Water that collects contaminants as it trickles through wastes, pesticides or fertilizers. Leaching may occur in farming areas, feedlots, and landfills, and may result in hazardous substances entering surface water, ground water, or soil.

**Legacy contamination** – Contamination that remains after facilities, operations, or activities that created it have gone out of existence or ceased, often resulting in an orphan site in need of remediation or institutional control.

**Line management** – The process of managing workers through individual Integrated Job Structure assignments (i.e., work titles) and contractor positions that support SNL's mission core processes and enabling processes.

**Long-Term Environmental Stewardship (LTES)**– Activities necessary to maintain long-term protection of human health and the environment from hazards posed by residual radioactivity and chemically hazardous materials.

**Low-Level Radioactive Waste (LLW)** – Wastes less hazardous than most of those associated with a nuclear reactor; generated by hospitals, research laboratories, and certain industries. The Department of Energy, Nuclear Regulatory Commission, and EPA share responsibilities for managing them.

**Low-Temperature Thermal Desorption (LTTD)** – A process of removing organic compounds from soil by heating it and causing the organics to volatilize and/or decompose. The volatilized compounds may be further degraded by after burning or catalysis.

## M

**Maximally Exposed Individual (MEI)** – The location of a member of the public which receives or has the potential to receive the maximum radiological dose from air emissions of a National Emissions Standards for Hazardous Air Pollutants (NESHAP) radionuclide source.

**Migratory birds** – All birds listed within the Migratory Bird Treaty Act, 50 CFR 10.13, or which are a mutation or hybrid of any such species, including any part, nest, or egg.

**Mixed Analyte Performance Evaluation Program (MAPEP)** – The MAPEP is used by the DOE as a quality assurance tool for environmental analytical services across the DOE Complex. It includes radiological, stable inorganic, and organic constituents (i.e., mixed analytes) in the same single-blind sample for analytical performance evaluation. The samples

use various matrices including soils, water, vegetation, and air filters. MAPEP samples are not a mixed waste.

Mixed waste – Radioactive waste that contains both source material, special nuclear material, or by-product material subject to the Atomic Energy Act of 1954, as amended; and a hazardous component subject to the Resource Conservation and Recovery Act (RCRA), as amended.

Mixed waste generator – Any person or organization generating mixed waste or causing a material to be subject to mixed waste regulations. Generators are responsible for the generation and subsequent management of mixed waste as part of their occupation or position. Generators may include managers, their employees, and contractors.

## N

National Emissions Standards for Hazardous Air Pollutants (NESHAP) – Emissions standards set by EPA for an air pollutant not covered by NAAQS that may cause an increase in fatalities or in serious, irreversible, or incapacitating illness. Primary standards are designed to protect human health, secondary standards to protect public welfare (e.g. building facades, visibility, crops, and domestic animals).

National Environmental Policy Act (NEPA) – The basic national charter for protection of the environment. It establishes policy, sets goals, and provides means for carrying out the policy.

National Pollutant Discharge Elimination System (NPDES) – A provision of the Clean Water Act which prohibits discharge of pollutants into waters of the United States unless a special permit is issued by EPA, a state, or, where delegated, a tribal government on an Indian reservation.

Natural resources – Resources (actual and potential) supplied by nature.

Nitrates – A compound containing nitrogen that can exist in the atmosphere or as a dissolved gas in water and which can have harmful effects on humans and animals. Nitrates in water can cause severe illness in infants and domestic animals. A plant nutrient and inorganic fertilizer, nitrate is found in septic systems, animal feed lots, agricultural fertilizers, manure, industrial waste waters, sanitary landfills, and garbage dumps.

Nitrites – 1. An intermediate in the process of nitrification. 2. Nitrous oxide salts used in food preservation.

Nitrogen Dioxide – A poisonous brown gas, NO<sub>2</sub>, often found in smog and automobile exhaust fumes and synthesized for use as a nitrating agent, a catalyst, and an oxidizing agent.

Non-Methane Hydrocarbon (NMHC) – The sum of all hydrocarbon air pollutants except methane; significant precursors to ozone formation.

Non-radiological contaminants – A source of contamination that has no radiological components.

Nuclear energy – The energy released by a nuclear reaction.

Nuclear particle acceleration – Imparting large kinetic energy to electrically charged sub-atomic nuclear particles (e.g., protons, deuterons, electrons) by applying electrical potential differences for the purpose of physics experiments.

## O

Outfalls – The place where effluent is discharged into receiving waters.

Ozone – A colorless gas (O<sub>3</sub>) soluble in alkalis and cold water; a strong oxidizing agent; can be produced by electric discharge in oxygen or by the action of ultraviolet radiation on oxygen in the stratosphere (where it acts as a screen for ultraviolet radiation).

## P

Perched groundwater – Groundwater that is unconfined and separated from an underlying main body of groundwater by an unsaturated zone (also known as perched water).

Perennial spring – A spring that flows continuously, as opposed to an intermittent spring or periodic spring.

Physiography – The study of the natural features of the earth's surface, especially in its current aspects, including land formation, climate, currents, and distribution of flora and fauna (also called physical geography).

Piezometer – An instrument for measuring pressure, especially high pressure.

PM<sub>10</sub> – Particulate matter (diameter equal to or less than 10 microns).

PM<sub>2.5</sub> – Respirable particulate matter (diameter equal to or less than 2.5 microns)

Point source – A stationary location or fixed facility from which pollutants are discharged; any single identifiable source of pollution; e.g. a pipe, ditch, ship, ore pit, factory smokestack.

Point source discharges – Any discernible, confined, and discrete conveyance from which pollutants are or may be discharged.

Pollutant – Generally, any substance introduced into the environment that adversely affects the usefulness of a resource or the health of humans, animals, or ecosystems.

Pollutant, water – Defined by the Environmental Protection Agency (EPA) as any physical, chemical, biological, or radiological substance that has an adverse effect on water.

Pollution Prevention (P2) – The use of materials, processes, and practices that reduce or eliminate the generation and release of pollutants, contaminants, hazardous substances, and waste into land, water, and air. For DOE, this includes recycling.

Polychlorinated biphenyls – “PCB” and “PCBs” are chemical terms limited to the biphenyl molecule that has been chlorinated to varying degrees or any combination of substances that contains such substance. Because of their persistence, toxicity, and ecological damage via water pollution, their manufacture was discontinued in the U.S. in 1976.

Potable Water – Water free from impurities present in quantities sufficient to cause disease or harmful physiological effects.

Practical Quantitation Limit (PQL) – The lowest level of analytical determination that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

Pulsed power – Technology is used to generate and apply energetic beams and high-power energy pulses.

## Q

Quality Assurance (QA) – A system of procedures, checks, audits, and corrective actions to ensure that all EPA research design and performance, environmental monitoring and sampling, and other technical and reporting activities are of the highest achievable quality.

Quality Control (QC) – Used in determining analytical accuracy, precision, and contamination when samples are collected, and to assess the quality and usability of the data.

## R

Radioactive waste – Any waste that emits energy as rays, waves, streams or energetic particles. Radioactive materials are often mixed with hazardous waste, from nuclear reactors, research institutions, or hospitals.

Radiological Contaminants – Radioactive material deposited in any place where it is not desired, particularly where its presence may be harmful.

Radionuclide – Radioactive particle, man-made (anthropogenic) or natural, with a distinct atomic weight number. Can have a long life as soil or water pollutant.

Radon – A colorless naturally occurring, radioactive, inert gas formed by radioactive decay of radium atoms in soil or rocks.

Reportable quantity (RQ) – Quantity of material or product compound or contaminant which when released to the environment is reportable to a regulatory agency.

Rodenticides – A chemical or agent used to destroy rats or other rodent pests, or to prevent them from damaging food, crops, etc.

## S

Sample Management Office (SMO) – An SNL office that manages environmental analytical laboratory contracts and assists with the processing and tracking of samples undergoing chemical and radiochemical analyses performed at these laboratories.

Sampling and Analysis Plan (SAP) – A plan containing various criteria required for conducting sampling activities.

Sanitary discharges – The portion of liquid effluent exclusive of industrial wastewater and storm water. The liquid discharges from rest rooms and food preparation activities.

Screened intervals – The section of water well piping below ground that is perforated or in some manner made porous to allow water to enter the interior of the casing and prohibit the entry of sand and rocks.

Seasonal recharge – Recharge of groundwater during and after a wet season, with a rise in the level of the water table.

Secondary containment – Any structure or device

that has been installed to prevent leaks, spills, or other discharges of stored chemicals, waste, oil, or fuel from storage, transfer, or end-use equipment from being released to the environment. Examples of secondary containment include pans, basins, sumps, dikes, berms, or curbs.

Semi-volatile organic compounds – Organic compounds that volatilize slowly at standard temperature (20 degrees C and 1 atm pressure).

Site-Wide Environmental Impact Statement (SWEIS) – A detailed public document, for which a federal agency is responsible, that provides analysis of the expected impacts on the human environment of a proposed action and alternatives to the proposed action.

Solid waste – Any garbage, refuse, sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility and other discarded material including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations and from community activities.

Statement Of Work (SOW) – A comprehensive description of the goods, services, or combination of goods and services for which SNL contracts.

Storm water – Water runoff from rainfall or snowmelt, including that discharged to the sanitary sewer system.

Sulfur Dioxide (SO<sub>2</sub>) – A colorless, extremely irritating gas or liquid, SO<sub>2</sub>, used in many industrial processes, especially the manufacture of sulfuric acid.

Surface discharge – Spilling, leaking, pumping, pouring, emitting, emptying, or dumping into water or in a location and manner where there is a reasonable probability that the discharged substance will reach surface or subsurface water.

## T

Thermoluminescent Dosimeters (TLD) – A device that monitors both the whole body and skin radiation dose to which a person has been exposed during the course of work. These same devices can also be used to measure environmental exposure rates.

Threatened and endangered species – A species present in such small numbers that it is at risk of extinction.

Time-weighted composites – A sample consisting

of several portions of the user's discharge collected during a 24-hour period in which each portion of the sample is collected with a specific time frame that is irrespective of flow.

Topography – The physical features of a surface area including relative elevations and the position of natural and man-made (anthropogenic) features.

Toxic (chemicals) – Any chemical listed in EPA rules as "Toxic Chemicals Subject to Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986."

Transuranic waste (TRU) – Radioactive waste containing alpha-emitting radionuclides having an atomic number greater than 92, and a half-life greater than 20 years, in concentrations greater than 100 nCi/g.

Trihalomethanes – A chemical compound containing three halogen atoms substituted for the three hydrogen atoms normally present in a methane molecule. It can occur in chlorinated water as a result of reaction between organic materials in the water and chlorine added as a disinfectant.

Tritium – A radioactive hydrogen isotope with atomic mass 3 and half-life 12.5 years, prepared artificially for use as a tracer and as a constituent of hydrogen bombs.

Turbidity – 1. Haziness in air caused by the presence of particles and pollutants. 2. A cloudy condition in water due to suspended silt or organic matter.

## U

Unconsolidated basin sediment – 1. A sediment that is loosely arranged or unstratified, or whose particles are not cemented together, occurring either at the surface or at depth. 2. Soil material that is in a loosely aggregated form.

Underground Storage Tank (UST) – A single tank or a combination of tanks, including underground pipes connected thereto, which are used to contain an accumulation of regulated substances, such as petroleum products, mineral oil, and chemicals, and the volume of which, including the volume of underground pipes connected thereto, is 10% or more beneath the surface of the ground.

Up-gradient – In the direction of higher water levels.

Upstream – In, at, or toward the source of a stream.

Uranium – A heavy silvery-white metallic element,



radioactive and toxic, easily oxidized, and having 14 known isotopes of which U 238 is the most abundant in nature. The element occurs in several minerals, including uraninite and carnotite, from which it is extracted and processed for use in research, nuclear fuels, and nuclear weapons.

USFS (U.S. Forest Service) Withdrawn Area – A portion of Kirtland Air Force Base consisting of land within the Cibola National Forest, which has been withdrawn from public access for use by the US Air Force and the US Department of Energy.

## V

Vadose zone – The zone between land surface and the water table within which the moisture content is less than saturation (except in the capillary fringe) and pressure is less than atmospheric. Soil pore space also typically contains air or other gases. The capillary fringe is included in the vadose zone.

Vanadium – A bright white, soft, ductile metallic element found in several minerals, notably vanadinite and carnotite, having good structural strength and used in rust-resistant high-speed tools, as a carbon stabilizer in some steels, as a titanium-steel bonding agent, and as a catalyst.

Volatile Organic Compound (VOC) – Any organic compound that participates in atmospheric photochemical reactions except those designated by EPA as having negligible photochemical reactivity.

## W

Waste characterization – Identification of chemical and microbiological constituents of a waste material.

Waste management – The processes involved in dealing with the waste of humans and organisms, including minimization, handling, processing, storage, recycling, transport, and final disposal.

Wastewater – The spent or used water from a home, community, farm, or industry that contains dissolved or suspended matter.

Water Pollution - The presence in water of enough harmful or objectionable material to damage the water's quality.

Water table – The level of groundwater.

Watershed – The land area that drains into a stream; the watershed for a major river may encompass a number of smaller watersheds that ultimately combine at a common point.

Wetland – An area that is saturated by surface or ground water with vegetation adapted for life under those soil conditions, as swamps, bogs, fens, marshes, and estuaries.

Wind rose – A graphical presentation of wind speed and direction frequency distribution.



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